PC MAGAZINE LIBRARY

CIRCULATING COPY

Please Return Promptly

NAL COMPUTING JANUARY 25, 1994 VOLUME 13 NUMBER 2 $2.95

rst Looks: New
,500 Apple
aserWriter 360
hallenges HP

Not Just for Artists: Four Illustration Packages

NETWORK EDITION

MAGAZINE

Stackable Hubs: 11 Solutions Make Networking Flexible And Affordable

Small-Business Accounting: Windows Makes It Truly Easy

Pentium PCs

The Fastest Ever

They Beat the 486s, Are They Worth The Price?

NETWORK EDITION

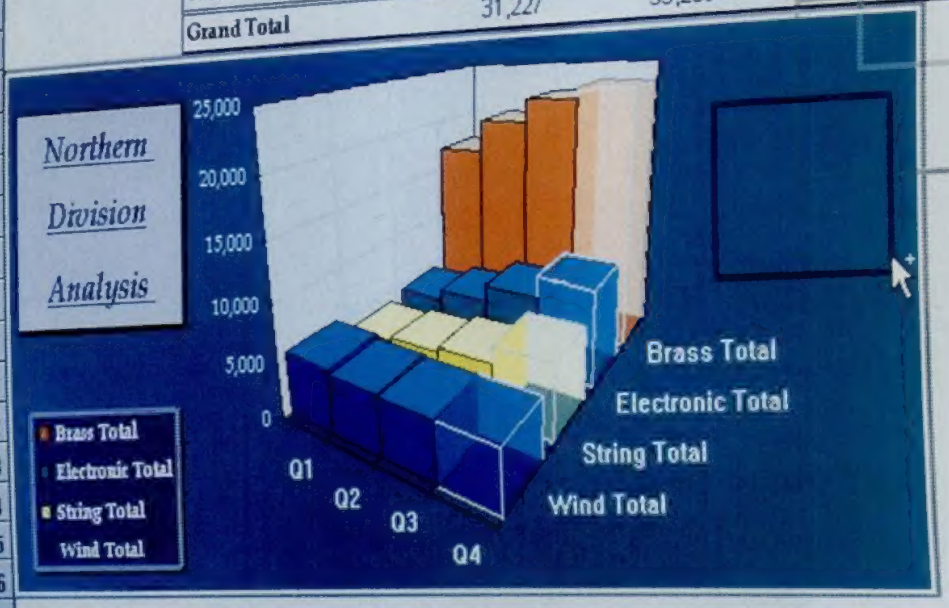
AFTER YEARS OF SETTING THE SPREADSHEET STANDARD, THERE WAS ONLY ONE THING LEFT TO DO.

Microsoft Excel - REVENUES.XLS

File Edit View Insert Format Tools Data Window Help

Northern Division Sales

CATEGORY	Q1	Q2	Q3	Q4
Brass Total	17,157	20,233	22,414	23,390
Electronic Total	4,637	5,564	6,955	8,722
String Total	3,904	4,366	4,328	6,420
Wind Total	5,529	5,126	4,982	4,932
Grand Total	31,227	35,289	39,179	43,464



North South East We

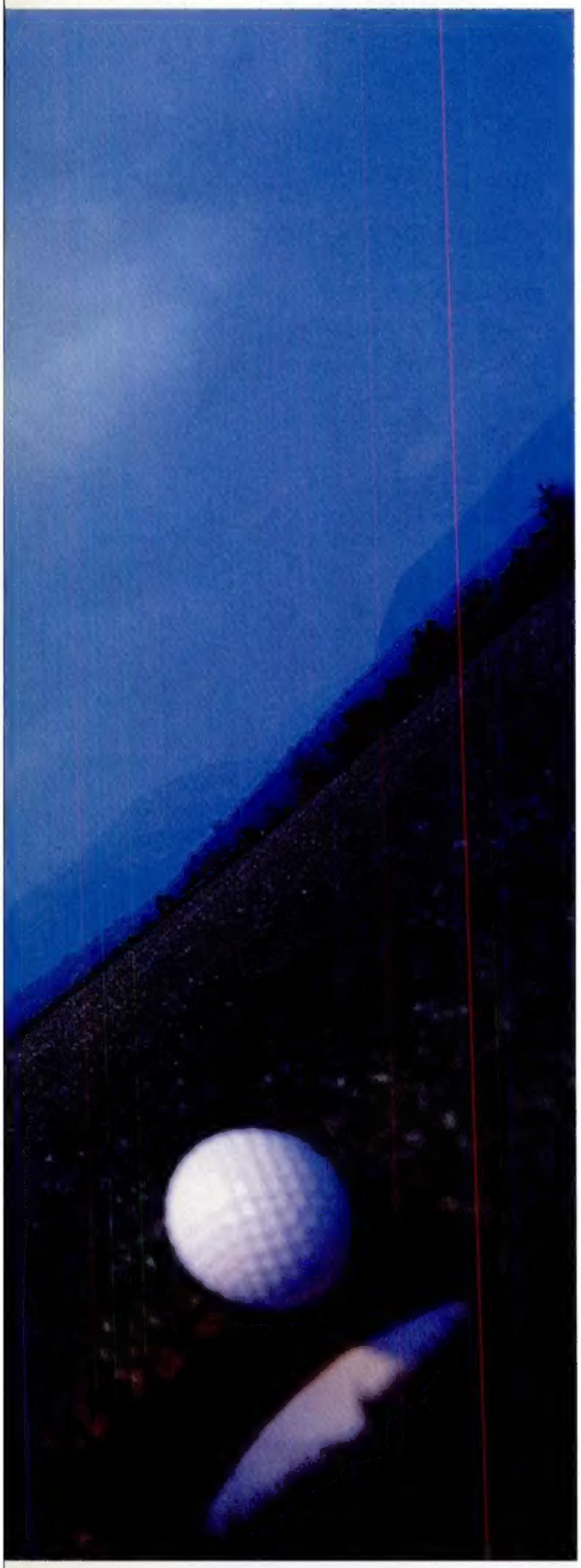
Copy data to chart as series or points.

"I hit a hole in one when I chose ACCPAC Plus! a start-up to a thriving $9 million business. And all along track, on course and under par."

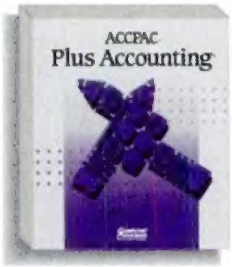
COMPUTER ASSOCIATES
Software superior by design.

© Computer Associates International, Inc., Islandia, NY 11788-7000. All product names referenced herein are trademarks of their respective companies.

It's helped us grow from the way we've stayed on



Name: Brad "Fore" Carr
Title: Founder/President
Company: Great Golf Balls, Inc.
Salary: $185,000/Year
Annual Sales: $9,000,000
5-Year Average Annual Growth: 60%
Software: ACCPAC® Plus™ Accounting
Favorite Module: "General Ledger. It's the ultimate scorecard."



General Ledger
& Financial Reporter
Accounts Payable
Accounts Receivable
U.S. and Canadian Payroll
Job Costing
Inventory Control
Order Entry
Retail Invoicing
Sales Analysis
ACCPAC LanPak
Windowing System Manager
DynaView

ACCPAC Plus Accounting Software.

It's versatile, with modules for a wide range of capabilities. It's easy to use, with lots of built-in features. It's customizable to the needs of virtually any type of business.

And it's backed by one of the world's largest software manufacturers.

No wonder it's the leading accounting software in North America.

For More Information
Call 1-800-225-5224, Dept. 30007.

Be sure to ask for details on ScanPAC™, the new bar code technology for ACCPAC Plus. Call now to see why more accountants and businesses prefer ACCPAC Plus.

And why you should join the club.

CIRCLE 348 ON READER SERVICE CARD

ACCPAC® Plus™: The #1 Accounting Software In North America.

MONARCH. A NEW WAY TO ACCESS CORPORATE DATA.

Now PC users can get their hands on corporate data, without burdening the MIS department, or tying into the central database. Introducing Monarch™, a unique PC application that uses ***existing computer reports*** as a source for data. Monarch extracts data from report files downloaded from any mainframe, mini or PC. Instantly, the reports come alive on your screen, so you can look things up, boil things down, get totals and subtotals, all at electronic speed. And you can send report data to applications like dBASE and 1-2-3. Call today for your free demo disk.

1-800-445-3311

personics

A DATAWATCH COMPANY

234 Ballardvale Street, Wilmington, MA 01887
(508) 658-0040 FAX (508) 988-0105

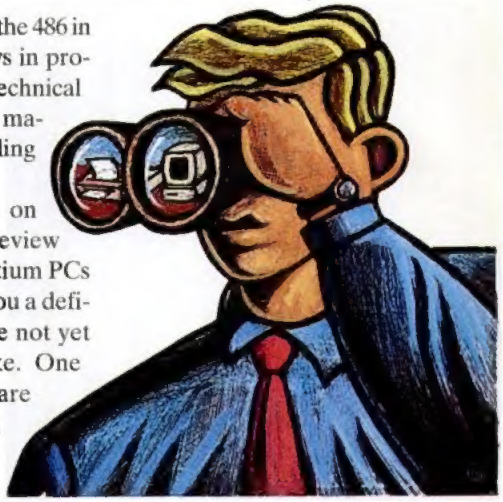
CALL FOR FREE DEMO

P2

CIRCLE 026 ON READER SERVICE CARD

Inside

You can always get a quick snapshot of the computer industry by perusing the table of contents for this magazine. This issue reflects several important trends. The first is in our cover story on Pentium PCs ("Pentium: The Second Wave"). Intel announced the successor to the 486 in March 1993. After delays in production and several technical glitches, the first real machines are finally trickling into the channel.



The tests we've run on the 11 systems in this review show that while the Pentium PCs are faster and will give you a definite speed boost, they're not yet the screamers we'd like. One reason is that vendors are still struggling to design machines that make the best use of these new chips. And there are competitors in the wings: Intel's own clock-tripled 486s, IBM's Blue Lightning, alternatives from AMD and Cyrix, and the new PowerPC chips from Apple, IBM, and Motorola. The CPU arena, once dominated by Intel, is suddenly crowded—and exciting.

Our coverage of Windows-based low-cost accounting software ("Windows of Opportunity") reflects another important trend—more ease of use—and deeper penetration of PCs into small business. For a long time, the industry worried that it was too focused on the Fortune 500 and not reaching the many small businesses that provide the bulk of jobs. Lower software prices—and ease of use—have largely solved that problem. And as our software team shows, while these programs may be easy to use, you really *can* run a business using them. The article on stackable network hubs ("A Hub Above") reinforces the growing importance of PCs in the enterprise.

Finally, our article on illustration software, "A Picture in Time," reminds us of the spreading reach of the PC. Several years ago, no decent artist would be caught dead near an Intel-based machine. These reviews show why the Mac is feeling the heat. *PC graphics* is no longer an oxymoron.

This is my last Inside column. I'm leaving to edit another publication. It's been a great catbird seat. Best wishes to all!
—*Joel Dreyfuss*

PC Magazine: The Independent Guide to Personal Computing, ISSN #0888-8507 is published biweekly except in July and August for $44.97 for one year. Ziff-Davis Publishing Company, L.P., One Park Ave., New York, NY 10016-5802. Second-class postage paid at New York, NY 10016 and at additional mailing offices. POSTMASTER: Address changes to PC Magazine, P.O. Box 54093, Boulder, CO 80321-4093. GST Registration Number: R-123669673. Canada Post International Publications Mail Product (Canadian Distribution) Sales Agreement No. 266477.

Illustration by Nip Rogers

Now Even Bad Reports Can Look Good.

New CA-RET™ 1.0: The Friendliest, Most Powerful Report Writer Ever.

Add bitmapped images anywhere in your report for graphic impact.

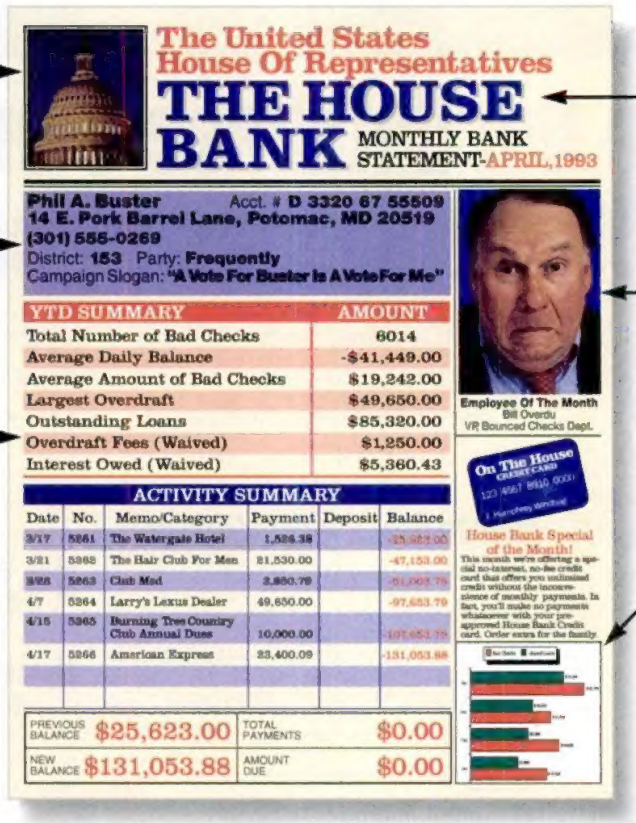
Create exciting output from your CA-Clipper, dBASE and text files.

Dozens of built-in number-crunching functions are available for powerful data analysis.

Using different fonts adds pizzazz to your reports. CA-RET makes it a snap.

The allure of color: You get it in an easy, WYSIWYG environment.

You can even turn your data into eye-catching graphs.



The United States House Of Representatives
THE HOUSE BANK MONTHLY BANK STATEMENT-APRIL, 1993

Phil A. Buster Acct. # D 3320 67 55509
14 E. Pork Barrel Lane, Potomac, MD 20519
(301) 555-0269
District: 153 Party: Frequently
Campaign Slogan: "A Vote For Buster Is A Vote For Me"

YTD SUMMARY	AMOUNT
Total Number of Bad Checks	6014
Average Daily Balance	-$41,449.00
Average Amount of Bad Checks	$19,242.00
Largest Overdraft	$49,650.00
Outstanding Loans	$85,320.00
Overdraft Fees (Waived)	$1,250.00
Interest Owed (Waived)	$5,360.43

ACTIVITY SUMMARY

Date	No.	Memo/Category	Payment	Deposit	Balance
3/17	5261	The Watergate Hotel	1,526.38		-25,623.00
3/21	5262	The Hair Club For Men	21,530.00		-47,153.00
3/28	5263	Club Med	2,980.79		-51,003.79
4/7	5264	Larry's Lexus Dealer	49,650.00		-97,653.79
4/15	5265	Burning Tree Country Club Annual Dues	10,000.00		-107,653.79
4/17	5266	American Express	23,400.09		-131,053.88

PREVIOUS BALANCE	$25,623.00	TOTAL PAYMENTS	$0.00
NEW BALANCE	$131,053.88	AMOUNT DUE	$0.00

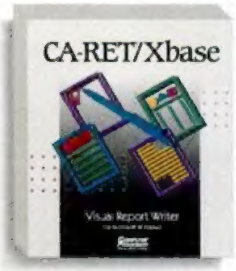
Employee Of The Month
Bill Overdu
VR Bounced Checks Dept.

On The House Credit Card
House Bank Special of the Month!

Whatever the news, make it look great with new CA-RET/Xbase, the visual report writer for Windows.

With drag and drop, WYSIWYG design, it's as easy to use as a word processor, yet powerful enough to produce stunning results. Choose a wide variety of pre-formatted tabular layouts, labels and form letters – or create your own. Now you can add dazzling color, fonts and bitmaps to any report.

Place database fields, computed fields and aggregate computations anywhere and use the more than 40 built-in functions for extensive analysis.



And CA-RET's single-pass computation engine is the most efficient available.

From dBASE to Clipper, CA-RET/Xbase works with top databases (or text files) and acts as a DDE server so you can include reports in other Windows applications. And the unlimited use runtime license lets you distribute report applications for free.

MICROSOFT WINDOWS COMPATIBLE

To order, just call 1-800-531-5236 (in Canada: 1-800-665-5449). Competitive offer available for just $79 ($89 in Canada). Ask the operator for details.

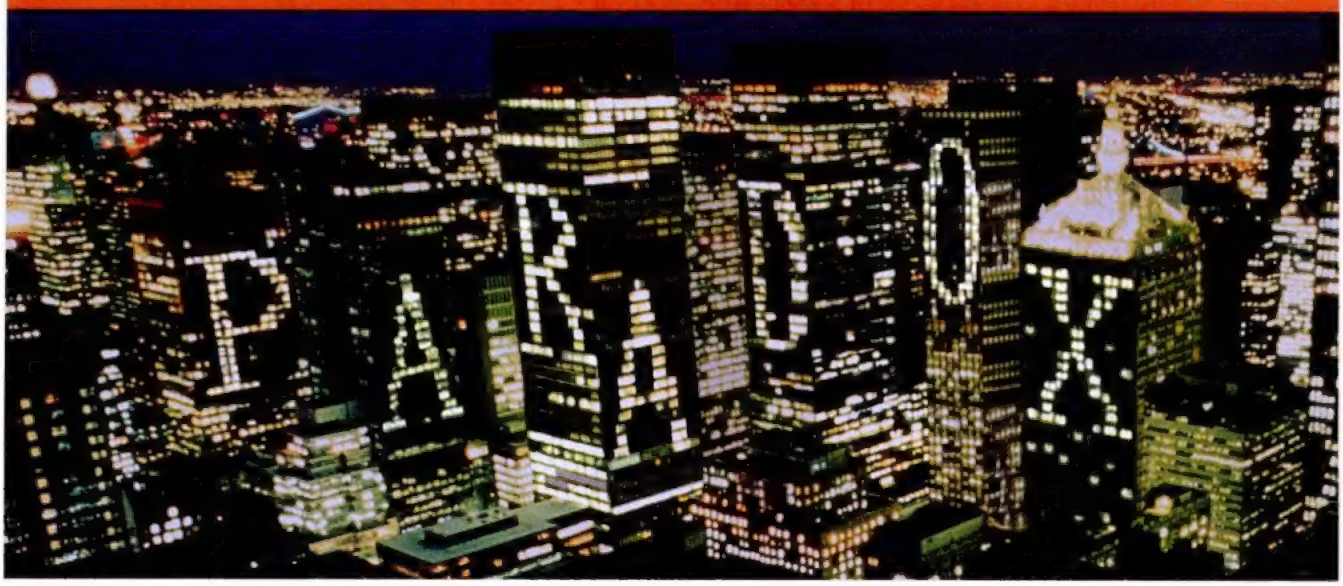
Call today and find out how easy it is to turn the mundane into the magnificent.

COMPUTER ASSOCIATES®
Software superior by design.

© Computer Associates International, Inc., One Computer Associates Plaza, Islandia, NY 11788-7000.
All product names referenced herein are trademarks of their respective companies.

CIRCLE 075 ON READER SERVICE CARD

THE LEADER IN OBJECT COMPUTING



Discover the database 9 out of 10 Fortune 500 companies already know

New version 4.5

Paradox® is the #1-selling database because it's the easiest way to access, manage, and present your information. Its unique object-oriented technology makes Paradox the only database with the future built in!

SQL ready

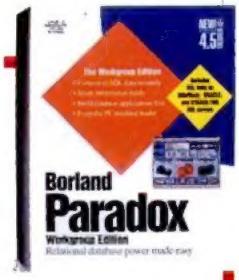
Instant plug-in connectivity to popular SQL servers like Borland InterBase,™ Sybase/MS,® and Oracle make it easy to "upsize" applications to secure client/server applications. And Paradox is the only database with a Workgroup Desktop, so you can send tables, query results, or even complete applications to anyone, anytime, anywhere in the world. Paradox is the best choice for a corporate standard, because nothing else combines such flexibility, speed, and ease-of-use to make users at all skill levels instantly more productive.

Information at your command

Only Paradox for Windows provides seamless access to all the most popular database formats—Paradox for DOS and Windows, dBASE,® and now, FoxPro. You can use all the data available, even on a network, combining DOS and Windows users. And with graphical Query By Example, it's quick and easy to get just the information you want.

If you want a relational PC database that's easy to use, fast, powerful, and gives you complete connectivity, the choice is easy. No wonder Paradox 4.5 for Windows Workgroup Edition is the standard that's lighting up corporations worldwide.

$149.95
Special Upgrade Price*



90-day, money-back guarantee!

See your dealer or call now, 1-800-336-6464, ext. 7880

In Canada call, 1-800-461-3327.

Borland
Power made easy™

*All Access, FoxPro, Superbase, and Approach owners qualify. $20 additional rebate for Paradox and dBASE owners. Copyright © 1993 Borland International, Inc. All rights reserved. All Borland product names are trademarks of Borland International, Inc. Prices good in the United States and Canada only. All prices are in U.S. dollars. Dealer prices may vary. BI 6233

CIRCLE 285 ON READER SERVICE CARD

PC MAGAZINE
January 25, 1994 Volume 13 Number 2

UP FRONT

Inside
An industry snapshot.....4

Letters
Don't Touch My Game Machine 19

Trends
- Mainstream 3-D
- Tax software hooks new users
- On-line services expand
- Houdini: Mac runs DOS 29

First Looks
- Microsoft Office 4.0
- Microsoft Word for Windows 6.0
- Two new Apple printers
- Four Mac-to-DOS utilities.....37

New & Improved
BY ANUSH YEGYAZARIAN 61

Read Only
EDITED BY LANCE ULANOFF 73

COLUMNISTS

Michael J. Miller
Conversations with My PC.....79

Bill Machrone
Chipping Away at Intel?.....87

John C. Dvorak
SOHO? Ho Ho! 93
Inside Track.....95

Jim Seymour
Breaking the Paper Chain....99

Bill Howard
An Environmental Celebrity Today—and Tomorrow ..105

COVER STORY

Pentium PCs

Pentium: The Second Wave

BY JIM SEYMOUR

Personal computing reaches new heights in terms of power and price with Intel's latest microprocessor—the Pentium. *PC Magazine* examines and evaluates the first 11 Pentium-based systems to hit the market and a few of the alternatives in the never-ending search for the world's fastest desktop PC 110

AcerPower Series 9000.....120
ALR Evolution V.....121
American Multisystems InfoGold Pentium 60 NT..121
Compaq Deskpro 5/60M.....127
Gateway 2000 P5-60.....128
HiQ P66 Pentium Graphics Ultra Station.....135
IBM ValuePoint P60/D.....136
Insight Pro Pentium-EISA.....136
MSE Pentium-P.....142
Tangent VL-P560.....155
Unitek UT-Pentium60LB.....157

Editors' Choice.....112
Highlights.....116
The Heat Is On.....120
Price/Performance Index.....127
Portable Power Pentium.....128
Alternatives to the Pentium.....138
Performance Tests.....146
Summary of Features.....155

Cover photograph by Chris Gould; cover illustration by John Hersey

PC MAGAZINE January 25, 1994 Volume 13 Number 2

FEATURES

Graphics

Illustration Software: A Picture in Time

BY LUISA SIMONE

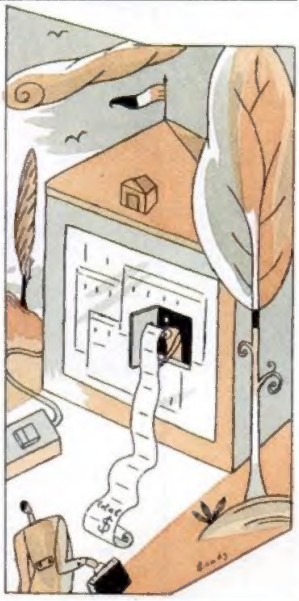
Like everything else in the computer industry, illustration software is evolving at a rapid pace. The feature wars have intensified, and the competition has gotten fierce. We examine four packages that offer sophisticated drawing tools and seamless handling of 24-bit color to help boost your creativity to previously unthought-of levels **161**

Adobe Illustrator for Windows *164*
Canvas for Windows *177*
CorelDRAW *186*
Micrografx Designer *188*

Editors' Choice 162
Suitability to Task 164
How We Tested 169
Upcoming in Illustration 175
Efficient PostScript Printing 180
Summary of Features 182

Small-Business Accounting

Windows of Opportunity



BY THOMAS WHITE AND KATHY YAKAL

Windows has turned small-business accounting on its ear! Accounting was one of the last strongholds of DOS-based software, but Windows has broken through the walls of tradition, paving the way for a new, easy-to-learn, easy-to-use generation of packages that serve the needs of even the smallest businesses. *PC Magazine* reviews nine programs that promise to take the strain out of keeping your eye on the bottom line **193**

BestBooks *200*
CashBIZ *202*
CA-Simply Accounting for Windows *202*
Do-It-Yourself Accounting *203*
Microsoft Profit *206*
M.Y.O.B. *217*
Peachtree Accounting for Windows *223*
QuickBooks for Windows *227*
Service Industry Accounting *230*

Suitability to Task 194
Editors' Choice 195
DOS Accounting Revisited 204
Summary of Features 216

Personal Finance Software

Digital Dollars & Silicon Cents

BY GREGG KEIZER

Today's crop of personal finance software programs offer more than just checkbook balancing and bank account tracking. They will even let you pay bills and download stock quotes, allowing you to keep a close eye on your money in the process. And the best packages supply rich portfolio management and sound money advice; you can watch your finances soar. Usability features, as well as extensive reporting and graphing capabilities, are also gaining new ground. In this review, *PC Magazine* looks at five packages that push the category to new limits **235**

Dollars & $ense *238*
Kiplinger's CA-Simply Money *240*
Managing Your Money *240*
Quicken for DOS *244*
Quicken for Windows *244*

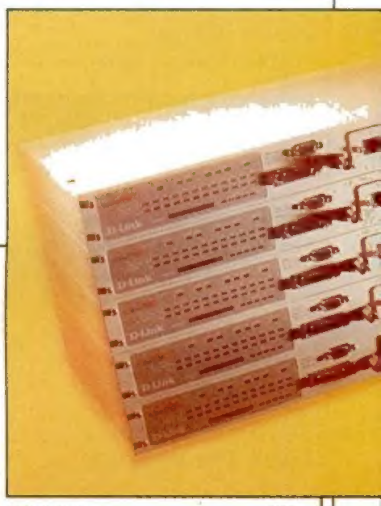
Editors' Choice 236
Suitability to Task 238
Summary of Features 241

Networking

A Hub Above

BY JEFFREY L. CARRELL

Is your Ethernet network beginning to outgrow the standalone hubs you bought a few years ago? If your network has been expanding steadily, you should consider turning to stackable hubs. They offer more flexibility than standalone models, and they can be cabled together to give more choices in network segmenting. And although stackable hubs can't handle some of the more complex tasks performed by higher-end enterprise hubs, they can be managed under SNMP-compliant software, giving network managers an affordable, middle-ground solution **247**



Accton EtherHub-12i *254*
AsantéHub 1012 ..... *255*
Cabletron SEH-24 ..... *259*
Cameo UltraHub 1000 ..... *261*
Compex TP3000 ..... *262*
D-Link DE-1200 ..... *265*
HP EtherTwist Hub/12 ..... *265*
Intellicom SP-HUB/B *270*
NetWorth Series 3000 Tri-Segment Stackable Hub *274*
SMC Elite 3812TP *275*
SynOptics LattisHub 2803 ..... *276*

How Hubs Work 248
Editors' Choice 249
Highlights 250
Evaluation Procedures 253
Suitability to Task 254
Summary of Features 258
More Power, More Complex 262
Variations on a Hub 263

PC —Available on PC MagNet.

NETWORK EDITION

Follows page 276

On the Road to ATM
BY NICK LIPPIS AND JOHN MORENCY
Hub vendors may have announced their ATM strategies, but how are you going to migrate your existing hub into the world of ATM? *PC Magazine* examines the plans of Cabletron, Chipcom, and Synoptics. NE1

First Looks
- HP OpenView for Windows 7.1 ..NE13
- NetWare Connect 1.0....NE13
- Lannet LanSwitch 208 Module ..NE22
- Xircom Pocket Ethernet Modem NE23

New & Improved
- Call Connection Manager NE25
- NetWare for LAT....NE25
- Intelligent Messaging for Unix..NE28
- Cabletron ESX-MIM NE28
- Trak/Report 2.0 ....NE28

Lippis on Networking
The Router Meets Jurassic Park..NE31

Derfler & Greenfield
Searching for the Right Modem Standard NE33

TECHNICAL COLUMNS

User-to-User
BY NEIL J. RUBENKING
A DEBUG script that lets you load COMMAND.COM into upper memory; a batch file that runs CHKDSK on more than one disk drive and prints a report of the results 277

Tutor
BY JEFF PROSISE
A Look at Graphics Drawing Algorithms....281

Corporate Developer
BY SAL RICCIARDI
Database Design: Redundancy and Normalization....285

Toolkits
BY NEIL J. RUBENKING
AccuSoft: Instant Image Processing....289

Environments
BY CHARLES PETZOLD
Extended Pen Creation Under Windows NT....291

Power Programming
BY KAARE CHRISTIAN
C++ Template Technology 297

Utilities
BY BOB FLANDERS & MICHAEL HOLMES
Spy on DOS Programs with Informer....302

Solutions
Peripherals
Finding drivers for high-resolution displays; reducing the time it takes to do large print jobs; emulating an Epson printer on a LaserJet 309

Operating Environments
Creating EDLIN scripts using EDLIN; loading DOS TSRs from a Windows DOS box....312

Word Processing
Running DOS commands from within WordPerfect 5.1....314

Spreadsheets
Hiding rows in Lotus 1-2-3 for Windows 4.0 320

Databases
An easier way to move a Paradox table to a different directory 322

Graphics
Troubleshooting incompatible printer emulations....322

Languages
How BASIC programs can pass information between DOS and Windows 322

AFTER WORDS

The Berenstain Bears make their PC debut (page 412).

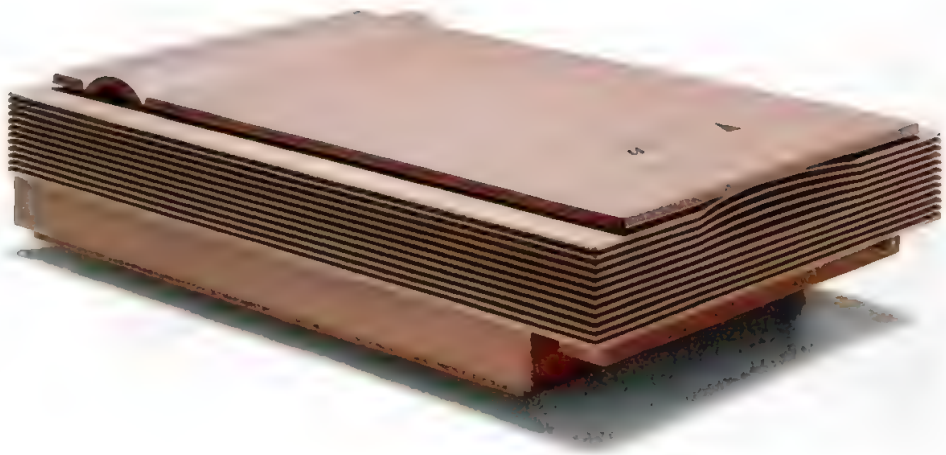
After Hours
- Bringing up baby: programs for new parents
- The Berenstain Bears learn at home
- Football sims
- Arcade mania! Three hot new pinball games....412

Abort, Retry, Fail?
BY DON WILLMOTT 416

ALSO IN THIS ISSUE

Direct Marketing Connection 309
Marketplace 377
Premier....377
Classified....387
Business Cards....401
Reader Service Card 399
Index to Advertisers....407
Advertisers' Product Index 408
Coming Up....410
Editorial Product Index 411

Semi-pro.



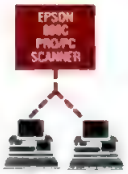
HP ScanJet II CX

If you're a sophisticated scanner user, you shouldn't have to settle for a semi-sophisticated scanner. Not when the EPSON 800C Pro/PC has so much more to offer. More versatile controls. More powerful software. Better connections. Stronger support. More flexible options. All of which makes this 800 dpi scanner the one that will actually live up to your

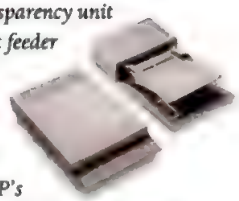
*One-year warranty, extendable to two years with return of registration card, at no charge. EPSON, HP, Macintosh, and Picture Publisher are trademarks or registered trademarks of Seiko EPSON, Corp., Hewlett Packard Co, Apple Computer, Inc., and Micrografx respectively. All other trademarks are the property of their owners. ©1993 EPSON America, Inc., 20770 Madrona Ave., Torrance, CA 90503. For dealer referral or warranty details, call **800-BUY-EPSON** (800-289-3776). In Canada, call **(800) GO-EPSON**. For Latin America, **305-265-0092**.

Pro.

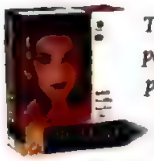
The 800C Pro/PC is solidly backed by EPSON's one-year warranty extendable to two years. HP's warranty is one year.*



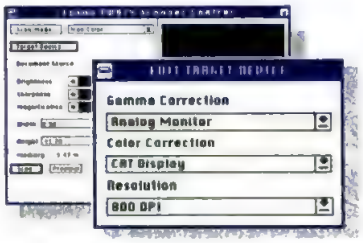
The 800C Pro/PC comes with both parallel and SCSI interfaces so you can connect it to two PCs or a PC and a Mac simultaneously. The ScanJet II CX connects to one computer.



EPSON's transparency unit and document feeder are powerful options that work across every scanner in our line. HP's scanner options aren't that flexible.



The 800C Pro/PC package includes the powerful full version of Picture Publisher 4.0, the industry's top-rated image editing software for the PC. HP's software is limited.



Only EPSON has color and gamma correction settings built right into the scanner hardware.

If you need technical assistance, you can call the pros at the EPSON Connection, our toll-free help line.

The scanning pros at PC Computing were so impressed with the 800C Pro/PC, they gave it their "Best Buy" award.

EPSON 800C PRO
FOR PC

exacting professional standards. For our free booklet on scanning, or more information on the 800C Pro/PC, our other scanners for PCs and Macintosh, or our full line of personal printers, call the EPSON Connection at **1-800-BUY-EPSON** (800-289-3776). And get the scanner that's in a league of its own.

EPSON®

Editor-in-Chief Michael J. Miller
Editor Joel Dreyfuss
Executive Editors Bill Howard, Robin Raskin

Director, PC Labs C. James Galley III **Art Director** David Herbick

Senior Networking Editor Frank J. Derfler, Jr.
Senior Editors Christopher Barr (West Coast), David Greenfield (Networking and Communications), Dale Lewallen (Technical Columns), Don Willmott (First Looks)

Managing Editor Paul B. Ross **Assistant Managing Editor** Dianne H. McDonald

Manager, Copy Edit Karen A. Carter **Associate Editors** Julie Cohen (After Hours), Gayle C. Ehrenman (Graphics), Leon Erlanger (Hardware), Carol Levin (Trends), Thomas Mace (Applications Development), Brian Nadel (PCs), Michael Neubarth (Graphics Hardware), Gail Shaffer (Networking and Communications), Ted Stevenson (Software), Sharon Terdeman (Technical Columns) **Technical Editor** Neil J. Rubenking **Production Editors** Shari L. Girouard, Kim Schueler **Copy Chief** Glen Boisseau Becker **Staff Editors** Tin Albano, Jamie M. Bsales, Kathleen Caster, John Clyman, Vicki B. Jacobson, Andrew C. Kantor, Ellyn J. McCasland, John Moore, Michael W. Muchmore, Michael Ryan, Craig L. Stark, Lance N. Ulanoff, Carol A. Venezia **Senior Writer** Robert S. Anthony **Staff Writer** Oliver Rist **Assistant Editor** Anush Yegyazarian **Copy Editors** Jeanne Albrecht, Robin B. Bornstein, Elisabeth H. Holzer, Jill Léger, Joseph N. Levine, Ann Ovodow, Michele Pepe **Assistant Copy Editors** Jay Amster, Asa Somers **Layout Manager** Linda Harms **Assistant Layout Manager** Shelly Fierston **Senior Layout Editors** Thomas DeVito, Lillian Gaffney **Librarian** Thomas W. Giebel **Library Assistant** Dolores Williams **Editorial Researchers** Mary E. Behr, Angela Hickman, Adam A. Hicks, Brendon M. Macaraeg, Brad Stilwell, Jodi L. Wynblatt **Editorial Assistant** Melissa J. Perenson **Business Manager** Justine Casey Gaeta **System Support Manager** Craig Ellison **PC Support Analyst** Melvin Acevedo **Production System Support Manager** Patricia Perkowski **Communications Manager** Diana Garelik **Assistant to the Editor-in-Chief** Tara Solon **Assistant to the Editor** Rita Aprahamian **Assistant to the Executive Editors** Christina M. Evelyn **Administrative Assistant** Christina Okang **Support Associate, PC MagNet** Louise Laberge **Sysop, PC MagNet** Ken Hipple

Contributing Editors Bill Machrone (Publishing Director), Douglas Boling, Bruce Brown, Sheryl Canter, Ray Duncan, John C. Dvorak, Mitt Jones, Nick Lippis, Michael J. Mefford, Edward Mendelson, Bill O'Brien, Charles Petzold, Alfred Poor, Jeff Prosise, John R. Quain, Sal Ricciardi, Winn L. Rosch, Joe Salemi, Jim Seymour, Richard Hale Shaw, Barry Simon, Luisa Simone, Craig Stinson, M. David Stone, Ethan Winer

Associate Art Directors Lisa A. Sergi, Charles Conover, Curtis M. Fields, Donna Panagakos **Assistant Art Director** Robin L. Malik **Assistant Graphics Director** David Foster **Graphic Artist** Josef Pusedu **Assistant to the Art Director** Frieda T. Smallwood **Contributing Photographer** Thom O'Connor

Technical Directors Rick Ayre (Software), Nick Stam (Hardware) **Testing Coordinator** Steve Buehler **Project Leaders** Jeffrey D. Baher (Network First Looks), Ben Z. Gottesman (Software), Jonathan Hill (Graphics Hardware), Robert P. Lipschutz (Networking and Communications), Jeff Mace (Graphics), Jay Munro (Applications Development), Tami D. Peterson (PCs), Michael J. Zulich (Hardware) **Programmers** Richard V. Dragan, Kenchai Prakobchart **Product Testing Manager** Charles Rodriguez **Technical Analysts** Laura Cox, Richard Fisco, William P. Flanagan, John Garris, Margaret A. Piemonte, Amarendra Singh, Dan Smith Ryan Tabibian **Support Technicians** Peter Bastide, Daniel A. Begun, Marino Delzotto, Constantine Fotopoulos, Deval Shah **Operations Manager** John R. Delaney **Inventory Control Coordinators** Mark Randall, Rob Graydon, William Pagan **Administrative Assistant** Angela M. Collins

Publisher Jim Stafford

Associate Publishers Anna Zornosa (West Coast), Daniel Rosensweig, Michael Perkowski (Marketing), Michael Wiener (Networking) **Advertising Director, East Coast** Lon Otremba **National Sales Manager** Bill Stephen **Sales Development Manager** Susan Federspiel **Client Services Managers** Steve Robinson (Systems), John Wisdom (Advertising) **Research Director** Michael Van Engen **Assistant Research Manager** Scott Gibson **Promotion Manager** Lisa DiBenedetto **Events Manager** Dawn Gudelis

Senior Advertising Production Manager Lori Iaccino **Advertising Production Manager** Pamela Berkowitz **Assistant Advertising Production Managers** Susan Conrad, Robert Joy **Senior Coordinator, Edit Production** Jo-Ann Hirschel **Coordinator, Edit Production** Mark Baard

Advertising Office: One Park Ave., New York, NY 10016-5802; 800 33 MAG AD, 212-503-5100

Ziff-Davis Publishing Company
Chairman and CEO Eric Hippeau
President J. Scott Briggs
President, Ziff-Davis Domestic Publications Group Ronni Sonnenberg
Executive Vice President, Centralized Operations Group Mike Edelhart
Executive Vice President, International J B. Holston III
Group Vice President, Controlled Circulation Publications Claude P. Sheer
Group Vice President, Paid Circulation Publications Jeff Ballowe
Senior Vice President, Circulation Baird Davis
Senior Vice President, Marketing Paul H. Chook
Senior Vice President Rachel Greenfield

Vice Presidents Bob Bader (Central Advertising Sales), James F. Ramaley (Circulation Services), Howard D. Sekolnik (Controller), Herbert Stern (Creative Services), Frank Kelcz (Europe), Rayna Brown (Human Resources), Ann Pollak Adelman (Marketing Services), Robert Ziff (New Projects and Strategic Planning), Dirk Ziff (Operations), Roger Herrmann (Production), Rolf Wulfsberg (Research), William B. Machrone (Technology) **Vice President/Managing Director Magazine Networks** Joseph Gillespie **Vice President, Assistant to the Chairman** Tom McGrade **Vice Presidents** Jim Stafford, Don Byrnes **Chief Information Officer** Wellington Y. Chiu **General Manager** Bruce Bourne **Executive Director, Information Systems** Owen Weekley **Executive Director, Marketing Services** Jim Manning **Directors** Jean Lamensdorf (Licensing), Gary A. Gustafson (Planning), Walter J. Terlecki (Production), Dan Leonetti (Sales Training), Susan Delman (Corporate Marketing), Lewis D'Vorkin (Editorial), Bill Catchings (Codirector ZD Benchmark Operation), Mark L. Van Name (Codirector ZD Benchmark Operation), Alicia Marie Ivans (Direct Marketing Programs), Gregory M. Jarboe (Public Relations)

Ziff Communications Company
Chairman William B. Ziff, Jr.
Senior Vice President and Chief Financial Officer Bruce Barnes
Senior Vice President Steven C. Feinman
Vice President, General Counsel, and Secretary J. Malcolm Morris
Vice President, Business Manager T.L. Thompson
Vice President, Chief Information Officer Thor Olson
Controller and Treasurer Timothy J. Mitchell

Subscription Inquiries, Address Changes

Subscription Services: For subscription service questions, address changes, or ordering information, call toll-free 800-289-0429 in the U.S. and Canada; all other countries, please contact Ireland: 353-61411466 or fax 353-61419457. Or write to *PC Magazine*, P.O. Box 54093, Boulder, CO 80322-4093.

Subscription Rate: The subscription rate is $44.97 for a one-year subscription (22 issues). Canada and all other countries, please add $36.00 for postage.

Back Issues: For back issues (subject to availability), $8 per issue ($9 outside the U.S.), send check or money order to Back Issues Dept., Ziff-Davis Publishing Company, P.O. Box 53131, Boulder, CO 80322-3131.

Computer Select: *PC Magazine* is available on Computer Select, a CD-ROM published by Computer Library. For subscription information, call Computer Library at 800-827-7889, ext. 708.

How to Contact the Editors

We welcome letters. However, we cannot look up stories from past issues, recommend products, or diagnose problems with your PC by phone. Send your written questions, complaints, and compliments to *PC Magazine*, One Park Ave., New York, NY 10016-5802. Please include a daytime telephone number. Send electronic mail to MCI Mailbox 157-9301, to CompuServe address 72241,104, Internet address 157.9301@mcimail.com, or to PC MagNet (see below). *PC Magazine*'s general number is 212-503-5255. The West Coast Operations number is 415-378-5500.

If you are dissatisfied with a product advertised in *PC Magazine* and cannot resolve the problem with the vendor, write (do not call) Jennifer Roth, Advertising Department, at the above address. Include copies of your correspondence with the vendor.

PC Magazine does not accept unsolicited manuscripts. We will pay $50 for Solutions and Programming user tips and for Abort, Retry, Fail? submissions. If you submit artwork or newspaper clippings with Abort, Retry, Fail?, mark up the photocopy, not the original.

PC MagNet

PC Magazine operates PC MagNet, an on-line service of ZiffNet, hosted by CompuServe. To join, set your communications software for 300, 1,200, 2,400, or 9,600 bits per second (bps), 7 data bits, even parity, 1 stop bit, and full duplex. To find the number nearest you, dial 800-346-3247. (In Canada, dial 800-635-6225, voice only.) When the modem connects, press Enter. At the Host Name prompt, enter PHONES. Follow the menus, note the number closest to you, then hang up and dial the number you have just found.

To obtain this issue's utility free of charge: Dial 617-231-4450, with your modem, to access the PC Magazine Utilities BBS. Enter your name at the prompt, and follow the menus. To join ZiffNet, at the HOST NAME prompt, enter CIS. At the USER ID prompt, enter 177000,5000. Enter PC*MAGNET at the PASSWORD prompt and PCMAG93 at the ENTER AGREEMENT NUMBER prompt. CompuServe members may join by typing GO PCMAG at any CIS ! prompt. ZiffNet membership is $2.50 a month, which includes access to *PC Magazine* Editors' Choice awards, Product Reviews Index, weekly news from *PC Week*, Buyers' Market, ZiffNet Highlights and Information, and the Support Forum. Connect-time charges are $12.80 per hour for 1,200 or 2,400 bps, or $22.80 per hour for 9,600 or 14,400 bps. Billing is based on 1-minute increments.

Permissions, Reprints

Material in this publication may not be reproduced in any form without permission. If you want to quote from an article or use *PC Magazine*'s logo in conjunction with an Editors' Choice designation, write Chantal Lavelanet; for information on reprints in quantities of 500 or more, write Carol Peters.

PC Magazine Reviews

Except where noted: All *PC Magazine* reviews are of currently available products. Benchmark and performance tests are run on Compaq Deskpro 386/25s and 25e's.

Editorial and Business Office: One Park Ave., New York, NY 10016-5802. Editorial: 212-503-5255; Advertising: 800 33 MAG AD, 212-503-5100. *PC Magazine* is an independent journal, not affiliated in any way with International Business Machines Corp. IBM is a registered trademark of International Business Machines Corp. Entire contents copyright ©1993 Ziff-Davis Publishing Company, L.P. All rights reserved; reproduction in whole or in part without permission is prohibited. The following are registered trademarks of Ziff-Davis Publishing Company, L.P.: PC, *PC Magazine*, PC Labs, PC MagNet, PC Magazine Award for Technical Excellence, PC Magazine Editors' Choice Award. The following are trademarks of Ziff Publishing Company, L.P.: Abort, Retry, Fail?; Advisor; Connectivity; Databases; Direct Marketing Connection; First Looks; Lab Notes; New and Improved; PC Marketplace; The PC Utilities; Pipeline; Power Programming; Power User; Read Only; Spreadsheets; Trends; Tutor; User-to-User; The Working Word

PRINTED IN THE U.S.A.

Don't Jump to a Graphic Conclusion

If you're about to take the plunge on a new graphics accelerator, get one that won't limit your future. ATI's GRAPHICS ULTRA+ and GRAPHICS ULTRA PRO give you no-regrets performance with all of today's applications. And they're perfectly poised for the leap forward into 32-bit operating systems and multimedia applications.

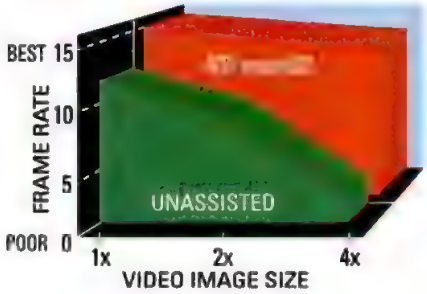
Get the Jump on the Latest Technology

Don't let inadequate technology give you or your PC a nervous breakdown. Our *mach32* Accelerator Chip and 2.0MB of standard memory accelerate graphics to heights that others can't match. And ATI's newest accelerators are multimedia-ready, with hardware-assisted scaling of motion video images under Windows for full screen playback.

accelerated by mach32 ATI TECHNOLOGIES INC.

indeo INTEL VIDEO TECHNOLOGY

MULTIMEDIA ACCELERATION



Software Safety Net

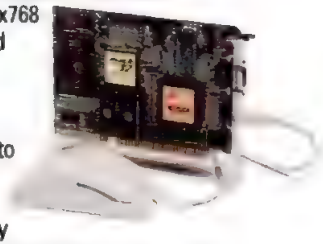
Software driver support shouldn't have to be a giant leap of faith... but without it, an accelerator is just an expensive VGA card. ATI gives you the best driver selection with the full security of 8514/A-compatible acceleration, plus up-to-the-minute ATI drivers for all major applications, including 32-bit environments, like OS/2 2.1 and Windows NT.[1]

Seamless Win OS/2 2.1 Now Shipping!

Don't Fall Behind

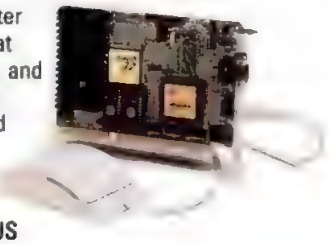
ATI helps you stay on the leading edge, without going over the brink financially. Our new upgrade plan[2] lets you move up to the latest hardware... at a fraction of the regular price.

GRAPHICS ULTRA+



- True color at 800x600 and 65,000 colors at 1024x768
- Non-interlaced 1280x1024 in 256 colors
- Flicker-free Windows, up to 76Hz refresh rate
- 2.0MB memory
- Fast DOS and graphics performance
- Enhances and accelerates Video for Windows
- **$299.00**[3]

GRAPHICS ULTRA PRO adds



- VRAM for better performance at higher refresh and greater colors
- Non-interlaced 1280x1024 graphics at 74Hz refresh
- ISA[4], or VL-BUS **$499.00**[3]
- EISA or Micro Channel **$549.00**[3]

So look before you leap. Drop in to your local ATI dealer and let our counselors help you avoid a graphic mistake.

CIRCLE 127 ON READER SERVICE CARD

GRAPHICS ACCELERATORS · MULTIMEDIA · COMMUNICATIONS

ATI TECHNOLOGIES INC. Perfecting the PC

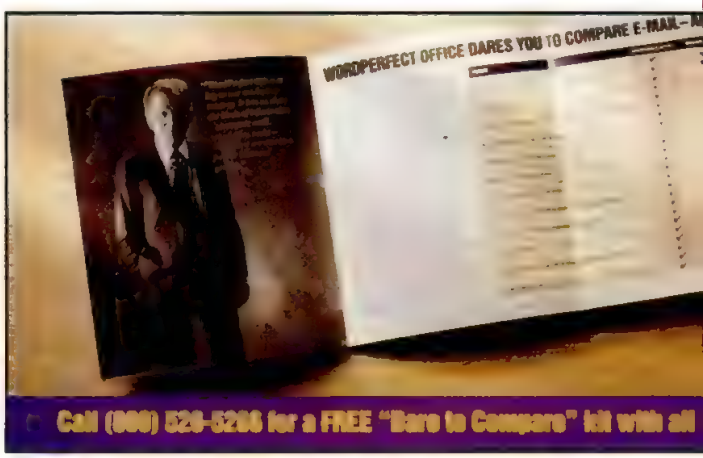
ATI TECHNOLOGIES INC.
33 Commerce Valley Drive East
Thornhill, Ontario
Canada L3T 7N6
Telephone: (905) 882-2600
Facsimile: (905) 882-2620
User Support: (905) 882-2626
BBS: (905) 764-9404

Copyright © ATI Technologies Inc., 1993. ATI, GRAPHICS ULTRA+, GRAPHICS ULTRA PRO and *mach32* are registered trademarks of ATI Technologies Inc. All other company and/or product names are trademarks and/or registered trademarks of their respective manufacturers. Features and specifications are subject to change without notice. Products may not be exactly as shown. [1]32-bit OS/2 2.1 drivers will be available in September 1993; 16-bit OS/2 2.1 drivers currently included. ATI drivers included in Windows NT package. [2]Tradeup plan to latest ATI products; call or fax for further information. [3]Suggested US retail prices, dealers may sell for less. [4]Mouse included with ISA versions only.

MICROSOFT AND LOTUS E-MAIL PRODUCTS TO

HERE'S WHY.

Microsoft and Lotus aren't going to publicly compare their e-mail products to something substantially better. That's why they never mention WordPerfect® Office in any of their e-mail comparison advertising. But while Microsoft and Lotus won't compare their products to WordPerfect Office, you should. Because choosing a workgroup application is a strategic decision that will affect the way your organization works for years to come.



Dare to compare more than just e-mail.

Even if you just compare e-mail features, WordPerfect Office 4.0 beats everything in its class. But it takes a lot more than

NEVER COMPARE THEIR WORDPERFECT® OFFICE.

	E-MAIL	INTEGRATED GROUP SCHEDULER	INTEGRATED CALENDAR	INTEGRATED TASK MANAGEMENT
WORDPERFECT OFFICE	YES	YES	YES	YES
MICROSOFT MAIL	YES	NO	NO	NO
LOTUS CC:MAIL	YES	NO	NO	NO

WordPerfect is a registered trademark, and WordPerfect Office is a trademark of WordPerfect Corporation within the United States and other countries. All other brand and product names are trademarks or registered trademarks of their respective companies. © WordPerfect Corporation 1993.

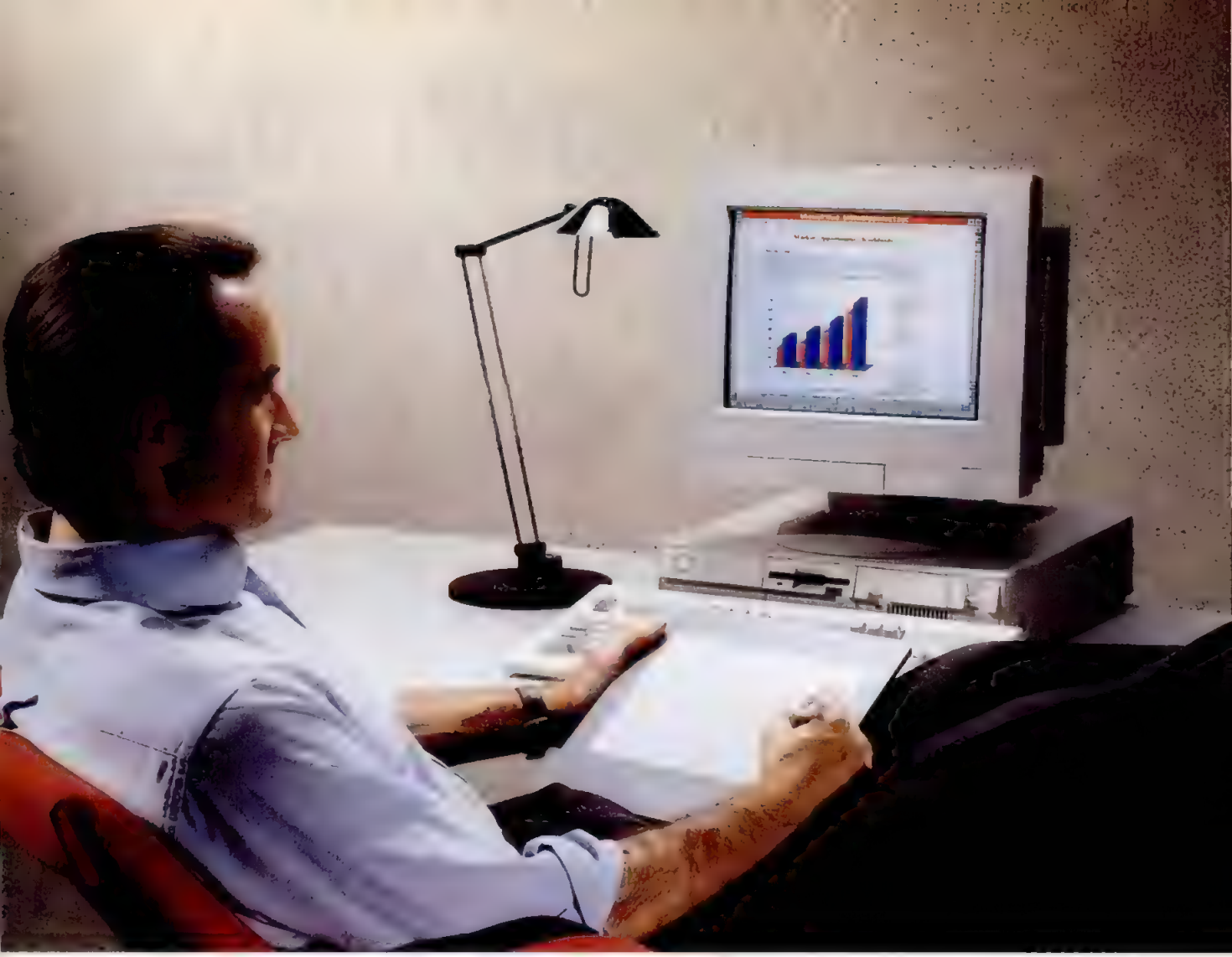
of this, including a working copy of WordPerfect Office 4.0.

e-mail to run a business these days. WordPerfect Office is the *only* leading workgroup application that integrates group scheduling, a personal calendar and task-management functions with the industry's most powerful cross-platform e-mail engine. And WordPerfect Office gives you the complete package for what others generally charge for e-mail alone.

Call (800) 526-5266 for a FREE "Dare to Compare" kit

There are more than 100 different features you should compare when choosing a workgroup productivity product, and we can't begin to mention them all here. So we've prepared a free Dare to Compare demonstration kit, with a working copy of WordPerfect Office 4.0 and a detailed comparison guide. Find out for yourself why Microsoft and Lotus won't compare their e-mail products to WordPerfect Office. Call (800) 526-5266 for your free kit.

WordPerfect® Office



Handwriter for Windows. The power of pen computing for your desktop.

What is Handwriter?

Handwriter, the complete input system, brings the power of pen computing to users at all levels of experience. It's 100% compatible with your Windows™ applications. Point, write, draw. It's as simple as using pen and paper—allowing you to maximize your comfort and creativity. And Handwriter is a fantastic complement to your keyboard.

For a limited time only

$199

Reg. $399

Fastest editing.

Move quickly and easily through any application. Just point and go. You can open and close menus, highlight and move text, add and delete words. Better still, simple shortcut gestures let you correct and edit your document with the stroke of a pen: copy, cut, paste, insert, delete and more. Sure, you can *enter* text faster with a keyboard. However, since 80% of document creation is editing, you'll save plenty of time using Handwriter.

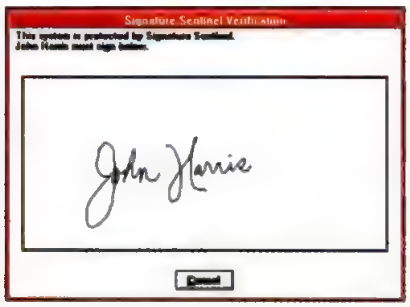
No pain. No drain.

Ever hear of RSI? Of Repetitive Stress Injuries? Guess what? OSHA reports that 56% of all work related injuries are RSI. These

injuries may occur when muscles or tendons are overused for extended periods of time. In rigid or cramped positions. Like sitting at a keyboard. Our ultra-thin, ultra-light tablet with ten foot cable and cordless pen allow freedom of movement. Using Handwriter in concert with your keyboard, you can stretch, move, and easily change positions while you work. Which is healthier. And a lot more productive.

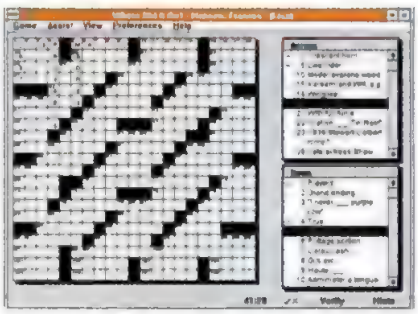
Signature security.

How do you protect your system? With a password? There's a better way. Handwriter's screen saver with our award-winning Dynamic Signature Verification™ software. How does it work? Simple. Sign your name and your system is protected. That's all there is to it. Handwriter "learns" your signature, and *how you write it*, virtually locking out forgery and tracing attempts. Meaning no one can access your PC but you.



Crosswords too.

After breezing through your workload, you can choose from a range of world-class crosswords to play. Challenge your mind. Have fun and find out how perfect pen computing is for that fill-in-the-form application that could make you rich and famous.



Award-winning handwriting recognition.

Skeptical that Handwriter can actually *read* your handwriting? Don't be. Our Handwriter Recognition System software is ranked #1 in the industry.* That's why it's already included in products sold by IBM, NEC and many other leading companies. And you can teach Handwriter to read your own unique style.

Companies Offering CIC Recognition Technology

Apple/Japan	NCR/AT&T
Arthur Dent	NEC
Dauphin	Samsung
Fujitsu	Seiko Epson
IBM	Toshiba
MicroSlate	and others

Handwriter for Windows includes:
Handwriter Recognition System software
Microsoft Pen Extensions for Windows
A screen saver with Signature Verification
Crossword puzzles and a way to get more
Ultra thin, ultra light tablet
Cordless pen

Satisfaction or your money back.

Hurry to order! Our **$199** pricing ends Febuary 28, 1994. Put the power of pen computing on your desktop by calling CIC today!

CIC.

Communication Intelligence Corporation
A NASDAQ listed Company.

Handwriter® for Windows™
THE CREATIVITY TOOL

(800) 888-9242 ext. 5001

*Voted #1 at PenExpo January 1993 and PenExpo September 1993. **This $199 (US) offer is valid only in the U.S. and Canada. Return privilege is 30-days provided the product is in resellable condition. For pricing information outside the U.S. and Canada, call (415) 802-7888. After Febuary 28, 1994, Handwriter will be $399. Handwriter and Dynamic Signature Verification are registered trademarks of Communication Intelligence Corporation. Windows is a registered trademark of Microsoft Corporation. All other names or products are trademarks or registered trademarks of their respective companies.

CORELDRAW!™

The World's Best Graphics Software

SWEEPS AWARDS

Once Again!

Graphics software users have praised CorelDRAW as the ultimate illustration and design tool once again! In a recent survey in *Publish* magazine, thousands of readers chose CorelDRAW 4 as the number one software in five separate categories: ***Draw, Paint, Type Special Effects, Clipart Collections,*** and ***Favorite New Product.*** And as the first choice of users for four years in a row, CorelDRAW has also earned a place in the ***Publish Hall of Fame.***

Winner of over 100 international awards, CorelDRAW is celebrated worldwide for its ease of use, incredible value and outstanding features. CorelDRAW 4 now leaps even further ahead by adding page layouts, animation and OCR, as well as hundreds of other feature enhancements. It's the best value in software today – and it's still the easiest to use!

CorelDRAW 4 includes illustration, charting, photo-paint, tracing/OCR and presentation capabilities. There are advanced word processing features and dozens of artistic and special effects. It's packed with more fonts, more clipart images and symbols, more graphics capabilities and more business applications.

Number one in five separate categories!

Draw
1. CorelDRAW, Corel Corporation
2. Aldus FreeHand, Aldus Corp.
3. Micrografx Designer, Micrografx Inc.

Paint
1. CorelDRAW, Corel Corporation
2. Fractal Design Painter, Fractal Design Corp.
3. Aldus PhotoStyler, Aldus Corp.

Type Special Effects
1. CorelDRAW, Corel Corporation
2. MakeUp, Bitstream Inc.
3. Adobe Type Align, Adobe Systems Inc.

Clipart Collections
1. CorelDRAW, Corel Corporation
2. Images With Impact, 3G Graphics Inc.
3. Presentation Task Force, New Vision Technology Inc.

Favorite New Product
1. CorelDRAW, Corel Corporation
2. LaserJet 4, Hewlett-Packard Co.
3. Fractal Design Painter, Fractal Design Corp.

CorelDRAW won additional awards in the categories of ***Type Collection*** and ***Font Creation and Editing***

KUR-0041

To receive a free CorelDRAW 4 demo disk, call for the location of the Egghead software store nearest you. To order directly from our Eggspress Ordering Service, please call
1 800 EGGHEAD

EGGHEAD SOFTWARE
North America's Software Eggperts.

Eggspress Ordering 1-800-EGGHEAD Call Direct

Hearing and Speech impaired customers can reach us by calling 1-800-949-3447 TDD.

CIRCLE 011 ON READER SERVICE CARD

COREL Ext. 20
1-800-772-6735

Letters

PLAYING GROWN-UPS' GAMES

In John C. Dvorak's column "Game Machines: Trend or Fiasco?" (November 9, 1993), it was mentioned that the Commodore Amiga is a failed game machine. I was programming on PCs for many years before I was introduced to the Amiga. Now that I have programmed on both platforms, I can truthfully state that the Amiga is a superior computer. Your beloved PC will never evolve beyond the 1970s technology with which it was designed.

Kenton A. Groombridge
Fort Belvoir, Virginia

Once again, Dvorak wouldn't know a superior computer system if it hit him on the head. He states that the Amiga was "a super game machine" that "failed miserably," but the Amiga was never meant to be a game machine. The Amiga still has video graphics capabilities superior to those of PCs, and has enjoyed success in the highly specialized niche of movie special effects and animation.

Clark Carty
Toledo, Ohio

Dvorak has downplayed the arrival of the 3DO system, but in doing so, he is ignoring the wealth of potential use for such a machine. Aside from the 3DO's educational and social possibilities as a standalone infotainment box, this may just be the ultimate platform to unite all CPUs, operating systems, buses, clock speeds, and just about everything else that's incompatible in modern microcomputers. 3DO is a uniform, comparatively low-cost, user-friendly, ecological, and fun device that can truly bring all users into the next dimension.

Christian de la Pointe
Chesapeake, Virginia

Where has Dvorak been for the past few years, during which a substantial part of the world abandoned the command economy in favor of a market-driven economy? His vituperative attack on the 3DO and other game machines would be absurd if it weren't so egotistical.

Market forces of supply and demand

Game Machines: Trend or Fiasco?

Market forces should determine the role of these new game systems.

should determine if there is a place for these new game systems. If the next generation of game machines fail, it should be due to lack of demand, and not the vitriolic pen of a columnist.

David J. Taylor
Moss Beach, California

In condemning game-only machines, Dvorak is not considering the advantages to a game-only machine versus a computer. Unlike the personal computer, game machines are conducive for families. They can hook up to your television, which offers the convenience of a large screen and proximity to the living room floor.

Scott K. Sheck
Gaithersburg, Maryland

MULTIMEDIA PCS SOUND OFF

I was amazed at the wealth of information to be found in a single issue of *PC Magazine*. The October 26, 1993, issue offered an in-depth evaluation of multimedia PCs ("Multimedia: Sight & Sound") that was particularly useful in assisting your readers, as consumers, to maneuver through the often confusing maze of multimedia system choices.

Carolynn Ranftle
Westwood, New Jersey

In your review of multimedia computers, you failed to emphasize the importance of the MPC certification. Also, it was not clear from your article which, if any, of your reviewed computers were MPC certified. This standard serves a dual purpose: It indicates to consumers a machine's ability to perform at a minimum level required for running multimedia applications, and it guarantees that MPC-endorsed software will run on similarly certified hardware.

Douglas Boyd
Sugar Land, Texas

Though your multimedia PC story was very helpful for advice on local-bus controllers, why didn't you review a multimedia system with Intel's PCI architecture, given that it is considered better (in terms of data throughput, expandability, and future compatibility) than the VESA local-bus standard?

Harvey C. Clowers
Buffalo, New York

• Firstly, we feel MPC is an outdated standard certification that tends to run at least a year behind software and hardware development. The first PCI machines we've received for testing are reviewed in this issue (see "Pentium: The Second Wave").—Ed.

TO EACH HIS OWN

The story "Documents Take Center Stage" (November 9, 1993) contained the following gem on WordPerfect 6.0 for DOS: "You may wonder why anyone with the hardware muscle to run it efficiently hasn't moved to Windows."

What kind of computer was that person using? Anyone running Windows 3.1 with a large font selection is familiar with the lengthy wait for Windows to load all of those fonts. Yet, after configuring my new WordPerfect 6.0 for DOS, the response time is virtually instantaneous. And when I need to add graphics to a document, I can do so quickly and easily.

Wanda Adams
Half Moon Bay, California

Of course, there are some things more exciting than waiting for graphics.

Indeed, time waits for no one. It only seems that way when you're waiting for your applications. Fortunately, there's a simple solution: the Premmia™ desktops from AST. Both desktops have local bus graphics and an integrated cache. As well as the ability to display over 16 million colors. (Just don't ask us to name them.) In simpler terms, that means extremely clear graphics in an extremely timely manner. As in, instantaneously. It also means faster text scrolling and screen updates – even faster data transfers. (Can they *ever* be fast enough?) And you'll also have access to sophisticated full-screen, full-motion video. To find out more, please call us at 800-876-4AST. You might as well do it now. While you have the time.

Premmia
HIGH-PERFORMANCE SYSTEMS

AST. COMPUTER

The Product Of Our Obsession.

©1993 AST Research, Inc. All rights reserved. AST, AST logo are registered trademarks and Premmia and LocalMotion are
Intel Corporation. All other trademarks are the property of their respective owners. *Estimated U.S. reseller selling price.

Premmia

HIGH-PERFORMANCE SYSTEMS

PREMMIA

An available range of Intel microprocessors, from 486SX/33 to 486DX2/66. 8KB internal cache. Up to 512KB second-level cache available. Five EISA slots. Intel OverDrive™ Ready. Midsize chassis. Starting at $1,525.

PREMMIA LX

Optimized Intel Pentium™ microprocessor design. 16KB internal, 256KB second-level cache standard. Two available PCI local bus expansion slots. Low-profile chassis. Starting at $3,325.

GRAPHICS

Integrated high-end local bus graphics – PCI on Premmia LX. 1MB video memory expandable to 2MB. AST LocalMotion™ full-screen, full-motion video drivers.

RELIABLE

*Three-year warranty, with first-year on-site coverage for hard-drive models.** Technical assistance 24 hours a day, seven days a week.*

Call for more information and the nearest reseller.

800-876-4AST

For a brochure via fax, call

800-926-1AST

Request document #52402 (Premmia), #52403 (Premmia LX).

intel inside

*rademarks of AST Research Inc. The Intel Inside logo is a registered trademark and Pentium and OverDrive are trademarks of eseller pricing will vary. **Remaining two years on-site on average. Three-year on-site warranty for most hard-drive models.*

LETTERS

I was astounded at your seemingly good recent review of WordPerfect 6.0 for DOS. After over five years of happily using different versions of WordPerfect products, I am now having trouble with almost everything I try to do that involves editing WordPerfect 5.1 files or using WordPerfect Presentations 2.0 graphics. Plus, WordPerfect 6.0 is extraordinarily slow (even with a 486DX/33), especially if you're trying to do a simple spreadsheet.

Vern Larson
Camarillo, California

After looking over the numbers listed under "disk space used by default installation" in your roundup of word processing software, I am concerned by the increasingly large hard disk space requirements for new programs. Already up to 16MB and still spiralling upward, the next generation of programs are draining to users' resources.

Richard John Mann
Portland, Oregon

THOUGHT I SAW A THINKPAD

I read the review "IBM's ThinkPad 750C: A Good Thing in a Lighter Package," (First Looks, November 9, 1993) with more anger than envy. Last February, I agreed to move back to Chicago from Fort Lauderdale, not for promises of wealth or power or sunshine, but because the job offer included a ThinkPad 700C. Well, to make a long story short, a string of leads and postponements continued through October, when IBM finally admitted that the 720C, which in the interim had already replaced the earlier model, had turned into vaporware in its truest sense and no machine would be forthcoming in the immediate future.

So as I prepare for my first cold winter in seven years, I am curling up with an alternative machine from another vendor, and though I am becoming more proficient with the built-in trackball, I still occasionally have IBM TrackPoint II fantasies.

Harry I. Shuman, M.D.
Chicago, Illinois

JUST ANOTHER GADGET?

John C. Dvorak mentions a business-card scanning product in his Inside Track for your of October 26, 1993, issue, and raves, "I need this product!" My only question is, what for?

How long would it take Dvorak to type a card into a PIM or electronic organizer? One minute, perhaps 2 minutes at the most, hardly enough to justify the cost of a specialized business-card scanner. The old-fashioned address book can still do a sufficient job in tracking business cards. I think Dvorak's normal, pragmatic streak must have taken a vacation while, as the rest of us often do, he became enamored of a neat technology solution that is really looking for a problem to solve.

Richard G. Shallhorn
Markham, Ontario, Canada

THE MATERIAL GIRL'S MATERIAL WORLD

As I was turning the pages of your issue of October 26, 1993, the headline for the First Look of Virtus WalkThrough for Windows jumped out at me. I was suddenly struck by the likeness of the headline to a particular, annoying tune that Madonna sings in a whiny voice: "Be in an im-ma-ter-ee-al world...." What a novel idea—virtual multimedia. I commend your innovative use of popular music to enhance the reading experience, but I do have one request. Next time, choose a better song. The one chosen here is too irritating, and the melody—if it can be called that—subsequently buzzed around inside my head like a fruit fly all day long.

Paul J. Camp
Conway, South Carolina

ON BIG BLUE'S BLUES

I was somewhat mystified by the Read Only review of "Big Blues: The Unmaking of IBM," by Paul Carroll (November 9, 1993). As an IBMer in the late 1960s, I always had nothing but good feelings toward Big Blue. However, I think that Carroll's book hit the nail on the head. What the reviewer missed was the fact that Carroll has documented one of the tragic results of corporate arrogance, myopic management, and a complacency often attributable to a lack of competition.

Contrary to what the reviewer noted, the insights offered by Carroll leap off the page. Carroll's book is about one of a long line of American corporate tragedies beginning with AT&T, moving through General Motors, and arriving at IBM. The book isn't about the computer industry; rather, it's about a company's failure to adapt to changing markets.

Peter D. Nugent
Kansas City, Missouri

PENTIUM MISUNDERSTOOD

In response to Jim Seymour's article "Misunderstanding the Pentium" (October 26, 1993), I have to wonder what Seymour is thinking by endorsing clock-tripled DX3s and clock-doubled Pentiums while dismissing the Power PC? *PC Magazine*'s June 15, 1993, story "The New PCs" heralded the case for RISC, proving its superiority to the current state of the art in CISC design—the Pentium. The Power PC and other RISC designs will do more than make a dent in the market in 1994, and I expect that the Power PC may very well determine the course of computing for the next decade.

Johnia Keys
Boise, Idaho

CORRECTIONS AND AMPLIFICATIONS

In our review of Premia Corp.'s programmer's editor, Codewright for Windows (October 12, 1993), we said the Codewright engine could be used within your own applications without paying royalty fees. This statement is misleading, as you may write programs that rely on the presence of Codewright, but users of these programs must have licensed copies of Codewright in order to use them. To distribute portions of Codewright with your applications, you must have an OEM agreement.

HOW TO WRITE TO PC MAGAZINE

We welcome your comments and suggestions. Please send your correspondence to Letters, *PC Magazine*, One Park Avenue, New York, NY 10016-5802, or upload it to PCMagNet (see page 12 for access information). All letters become the property of *PC Magazine* and are subject to editing.

Introducing C Set ++ FirstStep for OS/2.

Object oriented applications

Now everything you need to begin writing C/C++ applications is at your fingertips - and well within your budget. C Set ++ FirstStep is a state-of-the-art, C/C++ development environment. It includes: •An ANSI standard conforming compiler for C/C++ •A visual tool for debugging •C++ Collection Class Libraries •A comprehensive Developer's Toolkit (Version 2.1) with all necessary programming tools, and •WorkFrame/2: which provides an integrating environment that increases the effectiveness of those tools.

In short, with C Set ++ FirstStep for OS/2 from IBM Software Solutions, you can launch yourself right into writing high quality object-oriented applications.

start right here.

FirstStep Technical Features

- 32-bit C/C++ compiler.
- Visual PM Debugger.
- C++ Collection Class Libraries.
- Developer's ToolKit new V2.1.
- WorkFrame/2 (supports DOS, Windows and OS/2 tools).
- Open and configurable integration framework.
- Seamless integration of multiple edit.compile & debug tools.

Professional developers may require the additional features of C Set ++ V2.1, our professional developer's package including high-end tools, optimization and full support and service.

To order C Set ++ FirstStep for OS/2, or for further information call 1-800-342-6672 (U.S.A.) or 1-800-465-7999, ext. 670 (Canada). Or contact your local IBM software dealer.

C Set++

IBM and OS/2 are registered trademarks and C Set ++ is a trademark of International Business Machines Corporation.
Windows is a registered trademark of Microsoft Corporation.
© 1993 IBM Corp.

IBM

THE ZEOS® FREESTYLE™... THE FLEXIBLE SYSTEM FOR YOUR EVERY POSITION.

The feeling of freedom is unrestricting and comfortable. It's also power and strength. The ZEOS Freestyle gives you freedom of movement, power, and so much more.

The only notebook on the market with the revolutionary tilt and swivel screen, the Freestyle allows you to adjust the screen to the perfect viewing angle—no matter what your position. Use it in your lap, on a plane or for presentations.

For maximum power, we've given you the option of 386SL or 486SL Intel processors and memory options from 2MB to 20MB. We've also included such features as a built-in mouse key, internal floppy drive, soft carrying handle and many power management features. In addition, we offer an array of accessories. At only 5.6 pounds, including the battery, you'll want to take it everywhere.

Full desktop power with movement. It's a flexible choice. Why not call us to enhance your position? Your Systems Consultant can be reached at 800-554-7172.

Right Choices Are Hard.

Unique tilt and swivel display moves for your every position.

TOLL-FREE SUPPORT & WARRANTIES

We're here for you 24 hours a day, 365 days a year, and always a toll-free call away. All ZEOS systems come with a One Year Limited Warranty and a 30-Day Money-Back Guarantee. So call us now!

STANDARD WITH EVERY ZEOS FREESTYLE

- 25MHz 386SL, 25MHz 486SL or 33 MHz 486SL Intel microprocessor.
- 386SL: 64K SRAM system cache 486SL: 8K internal system cache.
- RAM expandable to 20MB (486SL) or 10MB (386SL).
- IDE hard drive expandable to 260MB.
- 640 x 480 VGA backlit LCD display, 9.5" diagonal supporting up to 64 shades of gray.
- Unique tilt and swivel display.
- 256K (386SL) or 512K (486SL) video RAM.
- Supports an external SVGA color monitor with simultaneous display capability.
- Internal 3.5" 1.44MB floppy drive.
- Serial, parallel, video and PS/2 (for keyboard, mouse or 10-key pad) ports.
- 486SL includes 3.3V technology for added battery life, and a built-in math coprocessor.
- Replaceable and rechargeable NiCad battery.
- 81-key keyboard with built-in mouse key, "inverted T" cursor keys and dedicated Home, PgUp, PgDn, and End keys.
- AC adapter from AC110-240V to DC.
- Power-saving features.
- FCC Certified Class B.
- Complete ZEOS Customer Satisfaction Package.

PACKAGE 1	PACKAGE 2	PACKAGE 3
386SL-25: $1195 Lease $50/month **486SL-25: $1595** Lease $58/month **486SL-33: $1895** Lease $69/month	**386SL-25: $1695** Lease $61/month **486SL-25: $1895** Lease $69/month **486SL-33: $2195** Lease $79/month	**386SL-25: $2195** Lease $79/month **486SL-25: $2395** Lease $87/month **486SL-33: $2695** Lease $98/month
■ 2MB RAM (386SL); 4MB RAM (486SL) ■ 60MB IDE hard drive (386SL); 120MB IDE hard drive (486SL) ■ MS-DOS 6.2	■ 6MB RAM (386SL); 4MB RAM (486SL) ■ 120MB IDE hard drive (386SL); 180MB IDE hard drive (486SL) ■ Custom nylon carrying case ■ MS-DOS 6.2 ■ Microsoft Windows for Workgroups 3.11	■ 10MB RAM (386SL); 8MB RAM (486SL) ■ 180MB IDE hard drive (386SL); 260MB IDE hard drive (486SL) ■ Internal 96/24 send/receive fax modem ■ Custom leather carrying case ■ Extra battery ■ External charging stand ■ MS-DOS 6.2 ■ Microsoft Windows for Workgroups 3.11

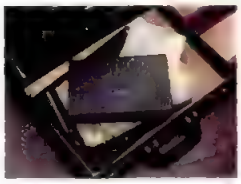
Purchase orders are subject to approval. Business leasing programs available. Lease prices based on a 36-month lease; 10% purchase option. All prices, specifications and availability are subject to change without notice;call to confirm these servicemarks, Freestyle is a trademark of ZEOS International Ltd ©1994 ZEOS International Ltd., 1301 Industrial Blvd.,

THE ZEOS® CONTENDA™... THE TRAVELER'S DREAM AT AN IDEAL FARE.

What a dream! The ZEOS Contenda subnotebook is small enough to tuck away in your briefcase and so light you'll forget you have it! It's the perfect traveling companion.

All your business and home needs conducted in a bundle just shy of 4 pounds. Write letters and memos. Create presentations. Keep in touch with associates through your choice of fax modems. Organize your files, calendar, planner and more.

What's more, with a standard 80MB hard drive, memory up to 10MB and your choice of a 386SL-25 or 486SL-25 Intel processor, the Contenda has plenty of power to run Windows. You'll also find you can work longer because the processor is intelligent enough to power-down the memory, disks, modem and more when they're not in use. In addition, the compact package includes a built-in trackball and high-resolution backlit screen.



Smaller than a notebook. Lighter than a hard-cover novel.

We've Made It Easy.

STANDARD WITH EVERY ZEOS CONTENDA

- 25MHz 386SL or 486SL Intel microprocessor.
- RAM expandable to 8MB (486SL) or 10MB (386SL).
- 486SL: IDE hard drive upgradable to 120MB.
- Display: 640 x 480 VGA backlit, .23 dot pitch. Sharp 7.4" diag., up to 64 gray shades.
- 256K (386SL) or 512K (486SL) video RAM.
- 486SL version includes 3.3V technology for added battery life, PI local bus for video acceleration, high-speed floppy drive controller, and built-in math coprocessor.
- Supports simultaneous display with an external SVGA color monitor.
- Replaceable and rechargeable NiMH battery.
- 80-key keyboard with embedded numeric keypad and easy-to-use built-in trackball.
- Serial, parallel and video ports, plus ports for internal fax modem and external floppy drive.
- AC adapter with full range from AC110-240V to DC.
- Fully-featured power management.
- 9.7" x 6.1"; 3.9 lbs.
- FCC Certified Class B; UL Listed.
- Complete ZEOS Customer Satisfaction Package.

PACKAGE 1	PACKAGE 2	PACKAGE 3
386SL Contenda: $995 Lease $42/month ■ 2MB RAM ■ 80MB IDE hard drive **486SL Contenda: $1395** Lease $59/month ■ 4MB RAM ■ 80MB IDE hard drive	**386SL Contenda: $1295** Lease $55/month **486SL Contenda: $1695** Lease $61/month ■ 4MB RAM ■ 80MB IDE hard drive ■ External 3.5" floppy drive ■ MS-DOS 6.2, Windows for Workgroups 3.11, Lotus Organizer	**386SL Contenda: $1595** Lease $58/month **486SL Contenda: $1995** Lease $72/month ■ 4MB RAM (386SL); 8MB RAM (486SL) ■ 80MB IDE hard drive ■ External 3.5" floppy drive ■ Custom leather carrying case ■ Extra battery ■ Internal fax modem ■ MS-DOS 6.2, Windows for Workgroups 3.11, Lotus Organizer

Computer Shopper readers' #1 Best Buy

It's a traveler's dream come true: The world at your fingertips in a mighty and tiny portable bundle. Don't get caught without it!

AWARD-WINNING SERVICE

We're the only company to win *PC Magazine*'s Readers' Choice for Service & Reliability—for both desktops and notebooks—*twice!*

CALL NOW TOLL FREE
800-554-7172
24 HOURS A DAY

Fax Orders: 612-633-1325, Government: 800-245-2449, Hearing Impaired (TDD): 800-228-5389, Outside U.S. and Canada: 612-633-6131. Purchase Orders, MasterCard, VISA, Discover, Am Ex, Z-Card,™ COD and affordable leasing programs. Open 24 Hours a Day, 365 Days a Year!

ZEOS INTERNATIONAL, LTD.

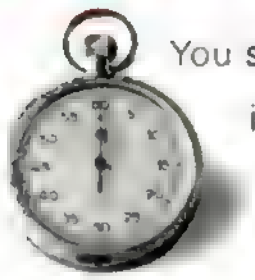
and warranty details. Prices do not include shipping. All products and company names are trademarks or registered trademarks of their respective holders. ZEOS and Contenda are registered trademarks; Z-Card and Computers Now! are registered. Minneapolis, MN 55413 USA. ZEOS is a publicly traded company (NASDAQ symbol: ZEOS). FSSN-PCM-9401B

CIRCLE 036 ON READER SERVICE CARD

wait

seco

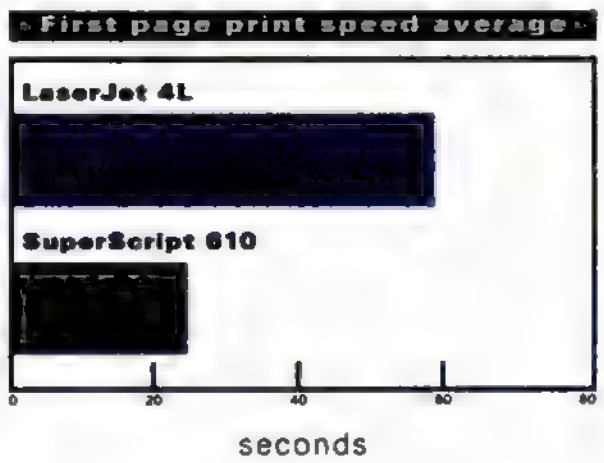
If you have to wait much longer to print, you need



You see, the NEC Silentwriter SuperScript 610 is the only laser printer that begins printing the second you press "Print." So you don't have to wait. And the only laser printer with a first page print speed that's three times faster than the HP® LaserJet® 4L.

The first Windows™ printer.

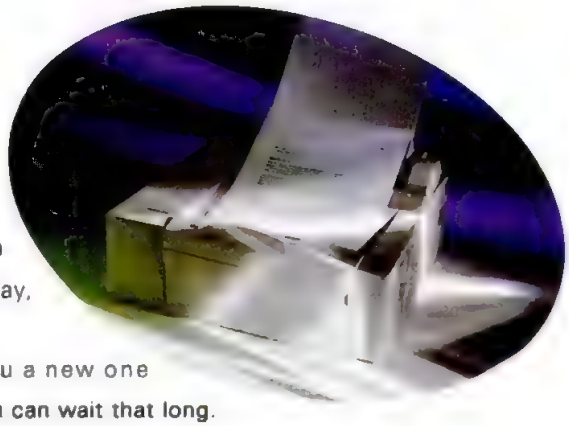
In fact, the SuperScript 610 is a whole new way of printing. It's the first personal laser printer that gets its processing power directly from Windows and your PC. That means it's as upgradable as your PC. So as your PC gets faster, so does your printer. In fact, this printer prints exactly what you see on your screen. Fonts, DOS applications, everything. And at less than $700 it's an even better value than you thought.



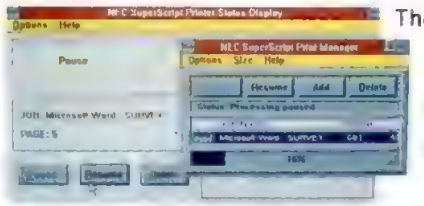
Based on 486-66 MHz PC with 8MB RAM. Average speed based on printing one-page documents from word processing, spreadsheet, presentation and graphics applications. The Energy Star emblem does not represent EPA endorsement of any product or service. Silentwriter is a registered trademark of NEC Corporation and SuperScript and FastFacts are trademarks of NEC Technologies, Inc. All other trademarks are property of their respective owners. © 1993 NEC Technologies, Inc. NEC GSA# GS00K93AG56241

t a
ond.

a Silentwriter® SuperScript™ 610.



See what's happening, while it's happening.



The SuperScript 610 even sends an on-screen status display to your PC that tells you exactly what's going on. So screaming, cursing and kicking your printer are no longer necessary.

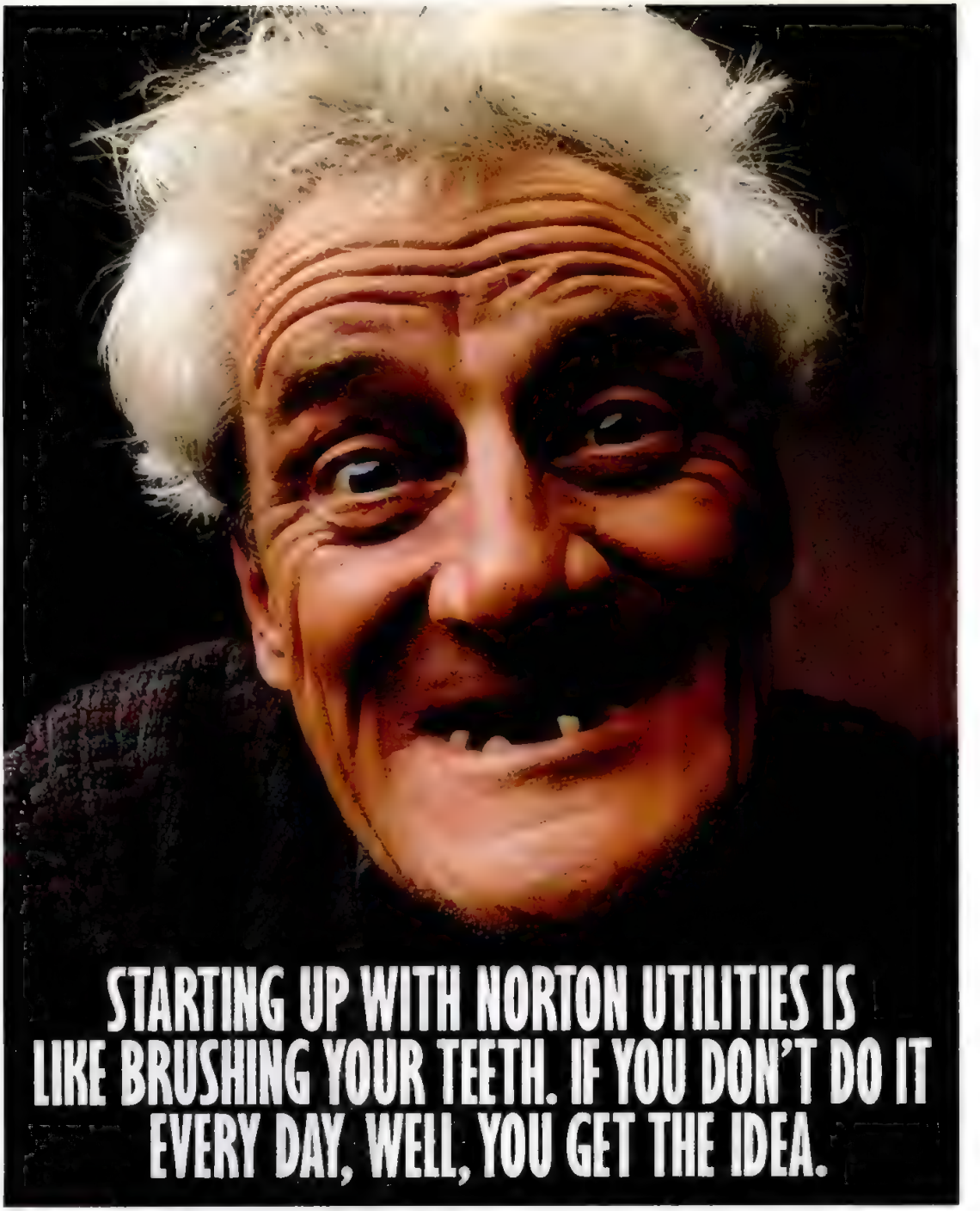
And it comes with a 2-year replacement warranty. So, if by some remote chance your Silentwriter 610 runs into bigger problems than an empty paper tray, have no fear.

We'll get you a new one overnight. If you can wait that long.

For more information on this exciting new technology, call 1-800-NEC-INFO. Or via fax, call NEC FastFacts™ at 1-800-366-0476. Request document #SW610.

NEC

CIRCLE 153 ON READER SERVICE CARD



PC MAGAZINE EDITORS' CHOICE Sept. 14, 1993

No, Norton Utilities™ 7.0 will not reduce ugly tartar buildup. But using it on a daily basis will virtually eliminate any chance of losing your important files, regular or compressed.

On start-up, our improved Norton Disk Doctor™ will automatically detect file system problems and fix them in seconds. And the new Norton Diagnostics will test all of your vital hardware components. Meanwhile, Speed Disk will optimize disk performance and improve your chances of recovering any lost data.

You also get nine other automated repair functions designed especially for compressed data problems.

If you'd like more detailed information, dial FAST FAX 1-800-554-4403, select option 1 and request document 447. Better yet, pick up a copy of the latest version of Norton Utilities at your nearest reseller. Then go ahead and take "prevent data loss" off your list of things to do today.

By the way, don't forget to floss.

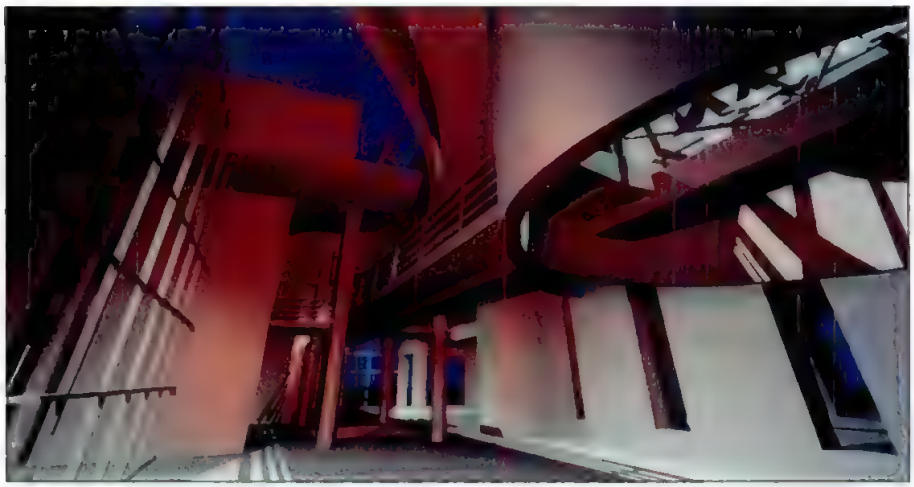
THE NORTON UTILITIES™ SYMANTEC.

For information in Europe, call 31-71-353111. Australia, 61-2-879-6577. Canada, 1-800-667-8961. Elsewhere outside U.S., 408-252-3570. The Norton Utilities and Norton Disk Doctor are registered trademarks and Norton Diagnostics and Speed Disk are trademarks of Symantec Corporation. The names of other products are trademarks or registered trademarks of their respective holders. PC Magazine Editors' Choice awarded 9/14/93. The Norton Utilities, Version 7.0. ©1993 Symantec Corporation. All rights reserved.

CIRCLE 334 ON READER SERVICE CARD

Mainstream 3-D

Stepping into interactive visualization.



What happens when you break through the boundaries of a two-dimensional workspace and enter an interactive three-dimensional environment displayed on the flat surface of a piece of glass? You may soon find out, thanks to recent initiatives that are charting the course for interactive 3-D on the desktop and convincing us that we want it there. The forces shaping the 3-D future are the adoption of new processors such as the Pentium and the PowerPC, which can speed matrix transformations essential to interactive 3-D; the falling prices of ever-faster graphics boards; and the development of 3-D software standards. Fueling it all is our insatiable appetite for entertainment.

To consumers, 3-D means the cool computer-generated graphics seen in movies like *Jurassic Park*. At the most fundamental level, it's the addition of the *z*-coordinate for depth to the vertical (*y*) and horizontal (*x*) planes of an image that you can manipulate in real time. In contrast to precomputed frames of animation, 3-D objects are constructed of rendered polygons with vertices that you can manipulate in real time.

So what's it good for? Computer-aided design, industrial design, visual simulation, animation, film, video, virtual reality, training, and life sciences. But the first revolution will be in 3-D games.

As computer-game junkies and CAD users know, 3-D is not new, but it's always been complex, expensive, and slow. That's all changing, thanks to several initiatives that are rapidly bringing interactive 3-D from the elite workstation world—where cars and buildings are designed—into the mainstream. Initially an enabling technology for entertainment and games, 3-D also offers a way to weave a more natural, intuitive interface into the base computing platform and to visualize abstract data such as stock market trends. Efforts are also underway for a 3-D interface to the televison set-top box, a future home appliance for managing new tasks such as decompressing digital signals and taking care of requests from couch potatoes. "Within five years, I guarantee you'll be seeing this stuff in your home," says Ken Morse, multimedia technologist at Kaleida Labs, where he's working on a standard for the creation and delivery of multimedia.

Recent steps indicate that it may be sooner. The Video Electronics Standards Association (VESA) has established the Advanced Graphics Interface committee, for which 48 companies are working on a low-level system programming interface that specifies how pixels and 3-D polygons are rendered to the display. A graphics library called OpenGL, which created 3-D effects only on Silicon Graphics workstations, is now available across multiple platforms and is expected to be included in Windows NT. Autodesk, which uses the term "interactive visualization" to describe the next step in 3-D graphics for design automation, recently bought Ithaca Software and HOOPS, its 3-D development tool that will eventually be part of AutoCAD. And Autodesk's new Cyberspace Developer Kit enables real-time interaction with architectural and other 3-D models.

On the hardware side, prices of video boards have plummeted (a Matrox graphics board with 3-D acceleration that cost $6,000 a year ago is less than $1,300 today), and board makers continue to improve chips for high-quality Gouraud shading and rendering, polygon fills, shading, and z-buffering, which recognizes the z-dimension. VideoLogic is working on a low-cost, RISC-based graphics board wtih workstation-like components, and Media Vision has released its OpenGL Software Development Kit for Windows NT so software developers can get started on 3-D applications.

"3-D is big, and it's only getting bigger," says Mason Woo of Silicon Graphics. "It's an enabling tool for a class of technologies, some of which we haven't even thought of," says Steven McGeady of Intel. Once you get used to working in 3-D, you may never want to go back.

—*Carol Levin*

Art by Ian Rattray/CRSS Architects Inc./ Silicon Graphics, Inc.

Pipeline *By Robin Raskin*

Taxing Times

In a year in which operating lean and mean is a central theme, let it not go unnoticed that the top vendors in the tax software arena are no longer tiny mom-and-pop outfits satisfying the needs of a lunatic fringe. They've become multimillion dollar companies, working fast and furiously to hook new users on the world of personal finance computing.

With key players in various states of upheaval, this will be the year that determines which of the companies owns the hearts and souls of personal finance consumers. ChipSoft (maker of TurboTax) is moments away from merging with Intuit (maker of Quicken), transforming both into one personal finance giant. H&R Block (owner of CompuServe and the single largest filer of electronic tax forms in the country) has nearly finished its acquisition of MECA Software (maker of TaxCut and Managing Your Money). The infusion of resources from H&R Block will help MECA take on the formidable Intuit/ChipSoft machine. Computer Associates, new to the tax software category, has entered the fray with fanfare, bringing with it a $9.95 version of Simply Tax. And a considerably less wealthy Parsons Technology is giving 250,000 free copies of Personal Tax Mate on a first come, first serve basis.

Each of the vendors is keeping the long term in mind. When it comes to tax software, upgrades to next year's releases are more necessity than choice. Marketing is complicated by the "head start" versions, which ship early in the year before the annual rate tables are available and help people get an early fix on what the tax season holds for them. Computer Associates charges only $9.95 for a head start version of Simply Tax, which contains the 1992 forms along with the 1993 expected rate tables. A coupon and $3 are all you need to upgrade to the final version. But Computer Associates makes no bones about the fact that next year's version will be sold at a "non-free" price.

Intuit and ChipSoft are keeping a low profile for now. With the papers not quite finished on the merger, ChipSoft is not changing TurboTax's current pricing and packaging. The company charges approximately $40 for the head start version and will send you the final version for free. But Intuit and ChipSoft have worked closely for years, and you can bet that Intuit's marketing savvy and earnest regard for usability will trickle into TurboTax. The new partnership will bring a tight integration to the packages—bringing us a step closer to the day when you press the "tax" button on your PC and spit out a few forms.

H&R Block (MECA) has the most complicated of the strategies. It'll sell you a $10 head start version and then charge you another $30 for the final version. But the head start includes a coupon for a $10 rebate, which translates to about $20 for the software. Parsons charges you $19 to move from the Personal Tax Edge to the full-fledged Tax Mate products.

Today's low prices may produce tomorrow's tax software junkie. Now that personal finance and tax software are so closely intertwined, we are witnessing nothing less than the making of a captive customer.

Robin Raskin is executive editor of PC Magazine.

On-line to Tomorrowland

THE INFORMATION HIGHWAY WILL be built upon the backs of today's bulletin boards and public on-line services using the bricks and mortar of modems, data lines, and communications software. On-line services used to be ugly beasts that required arcane commands, but the big public services have improved their interfaces and features to attract the multitudes that are required to make the services profitable.

Prodigy, the joint venture of Sears and IBM, has made easier navigation the main goal of its software. The first version was slow and difficult to use, but a new Windows interface offers such amenities as pull-down menus, macro capabilities, and Windows Clipboard and printing facilities. Prodigy is also beginning to put sound and photos on-line. New 9,600-bps access lets you move much more quickly from, say, the business area to the children's section. In the future, a separate Windows-based mail package will send e-mail, faxes, and snail mail to and from the Internet.

Prodigy's new Windows interface signals an industry-wide shift. You don't have to be a rocket scientist to connect to the on-line world.

CompuServe, which is owned by H&R Block and hosts *PC Magazine* on ZiffNet, is boosting features for power users. While its 9,600-bps service is common, CompuServe has begun providing 14.4-Kbps service. And CompuServe is also adding a Windows version of Navigator, which is batch-oriented, to its stable of interface software.

In 1993, AT&T bought The Sierra Network and renamed it the Imagination Network (INN) with the goal of turning it into AT&T's entertainment vehicle. The company is now pouring money into game development, including educational games you can play with others over the network. With an interface that lets you choose the face you show to other players, INN is geared for users of all ages. It also has the easiest user interface for children to comprehend. Later this year, INN will offer a feature-packed CD-ROM version of its interface. INN also plans to enhance sound and graphics and will offer a tour of the service, where you can practice games off-line before taking on your virtual partner.

—*Christopher Barr*

Next-Generation Displays

AMERICA WANTS TO REGAIN THE lead it lost to the Japanese in display technology. The competition is the driving force behind several recent initiatives, including the creation of the American Display Consortium and the Phosphor Technology Center at the Georgia Institute of Technology.

At the Atlanta center, researchers are working on improvements in today's phosphor technology, the foundation of television displays, fluorescent lights, computer monitors, and laptop display backlights. Phosphors are materials composed of oxides and sulfides activated or "doped" with rare earth elements that produce light naturally. "All phosphors have different mechanisms of excitation, and we don't have a very good understanding of how the mechanisms work. If we can better understand that, we can use this understanding to create phosphors that are more efficient," says Dr. Stuart Jacobsen, a research scientist at the center. The single largest consumer of power in a notebook is the backlight, a flat fluorescent lamp lined with phosphor. Hence, the need for more energy-efficient backlights.

The first breakthrough in color phosphor research occurred at RCA labs in the 1950s, and it brought us the color television. Jacobsen hopes the work at the center will produce new breakthroughs in high-definition television and chip-on-glass technology, where both the phosphor and the complex silicon circuitry of the PC are integrated into the screen. "If you're not in screens, you're not in computers. So you better be in screens. The challenge is to find phosphors that can produce red, green, and blue light of just the correct range to satisfy the human visual system and to do this in an energy-efficient manner," says Jacobsen. Technologies for high-definition displays include: CRT; electroluminescent displays (unlike LCDs that apply red, blue, and green filters to white light, EL devices are based on red, blue, and green phosphors); field-emission devices (a new type of low-voltage display that uses an array of *microtips* to address each pixel); and plasma display panels.

The center expects the first fruits of the research to pay off in one to three years.
—*Carol Levin*

Top Retail Software

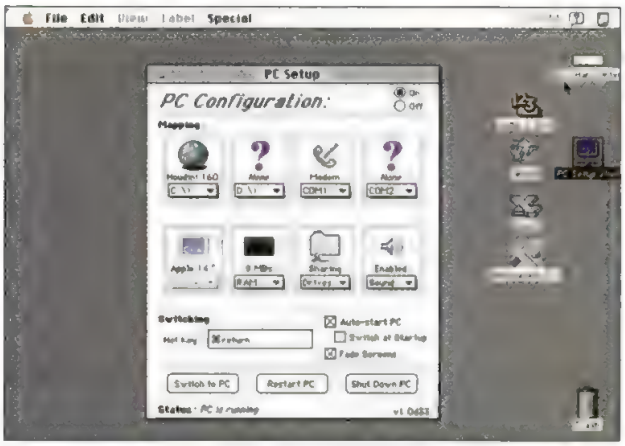
Current ranking	Last issue	Product/ company
1	1	**MS-DOS 6.2 Upgrade** *Microsoft Corp.*
2	—	**MS Office for Windows 4.0 Upgrade** *Microsoft Corp.*
3	4	**Quicken 3 for Windows** *Intuit*
4	3	**MS Windows 3.1** *Microsoft Corp.*
5	13	**Quicken 7 for DOS** *Intuit*
6	—	**MS Office for Windows 4.0** *Microsoft Corp.*
7	—	**TurboTax Headstart** *ChipSoft Inc.*
8	—	**Word for Windows 6.0 Upgrade** *Microsoft Corp.*
9	2	**Quattro Pro 5.0 for Windows** *Borland International*
10	8	**WordPerfect 6.0 for DOS** *WordPerfect Corp.*
11	—	**WordPerfect 6.0 for DOS Upgrade** *WordPerfect Corp.*
12	11	**MS Publisher 2.0** *Microsoft Corp.*
13	—	**MS Access for Windows 1.1** *Microsoft Corp.*
14	—	**Lotus 1-2-3, Release 4.01 for Windows Upgrade** *Lotus Development Corp.*
15	—	**CorelDRAW 3** *Corel Corp.*

The list ranks PC business programs according to the total number of copies shipped to stores and resellers in the week ending November 13, 1993. The list is based on shipments to more than 12,000 retail locations. It does not include sales made directly by software publishers and cannot be interpreted as a picture of the entire software market. Sales information adapted from a compilation by Ingram Micro.

MacDOS

THE TERM *CROSS-PLATFORM* WILL take on a new meaning when Macintosh computers can run DOS and Windows applications. Although it sounds farfetched, Apple is developing a coprocessor adapter card that will allow certain Macintosh models to boot DOS and run DOS and Windows applications. Code-named Houdini, the card will contain a 25-MHz Intel 486SX, VGA circuitry, BIOS, and a proprietary port for a cable that can drive a VGA display.

The idea of running DOS or Windows applications on a Macintosh is not new. In the 1980s, AST developed coprocessor cards for the Macintosh II and SE models, but they sold poorly due to slow performance and high price. Orange Micro makes two 486-based coprocessor cards for Macintosh computers that have a NuBus architecture but are priced from $900 to $1,900. Insignia Solutions makes a software emulation program that runs Windows on a Mac, but only at 286 speeds. Houdini has a number of features the others don't have: It will be able to share memory with the host Macintosh system or have up to 32MB of its own dedicated memory. Since Houdini is a coprocessor, it will run DOS and System 7 simultaneously. You will be able to run two monitors, one showing System 7 and the other one DOS, and switch between them with a hotkey combination. While you won't be able to network Houdini technology, Apple is licensing Microsoft's CD-ROM driver so you can use DOS and Windows-based CD-ROMs and access the host systems' serial port.



Houdini, Apple's prototype coprocessor card, runs DOS.

Apple is licensing MS-DOS 6.2 and will sell a version of the Centris 610 with the coprocessor and DOS installed. You'll have to use your own copy of Windows, but you'll be able to cut and paste between Mac and Windows apps using Houdini's 64-bit messaging channel.

Will it sell? Apple hopes its coprocessor card will succeed where the others haven't. Apple is working hand in hand with Microsoft and Intel to insure compatibility. Apple will price the coprocessor card around $500, which will make it affordable for home users who have a Centris or Quadra and want to run the DOS or Windows applications they use at work.—*Christopher Barr*

Suite Truths

WITH SOFTWARE SUITES THE MARketing trend *du jour,* major suite vendors are changing the look and feel of all the products within their suite so that the products have a common interface with identical icons and menu items. The plan is to make you so comfortable with one interface that you eschew all others.

Lotus started the trend with SmartSuite, which unites 1-2-3, Ami Pro, Approach, Freelance Graphics, and Organizer. It developed SmartIcons, a system of icons to use in all its products to launch tasks such as opening and closing files and spell-checking. Microsoft will follow with Microsoft Office 4.1, which will feature Word 6.0, Excel 5.0, and PowerPoint 4.0 sharing a common menu design. Since each company owns the underlying code base of its products, making the suites of applications look alike shouldn't be too difficult.

Borland, on the other hand, has its work cut out for it with Borland Office 2.0, which will include WordPerfect 6.0, Quattro Pro 5.0, and Paradox 4.5. It won't be easy to make Paradox look like WordPerfect, but that's exactly what Borland plans to do. (It's not an impossible task because WordPerfect uses Borland programming tools.)

Borland has finally unveiled its answer to inter-application programming, which Microsoft addresses with Visual Basic for Applications (VBA). Object Automator is an interpreted scripting language that, like VBA, works with OLE 2.0. Although it's geared for controlling one application from within another, it won't be ready in time for Borland Office 2.0 and will be put into a later release. The Windows applications it will control are Quattro Pro, dBASE, Paradox, and WordPerfect 6.0.

—Christopher Barr

Briefs

DIGITAL SHOPPING MALL DEBUTS. L.L. Bean and 20 other brand-name catalogs are showcased in a new CD-ROM titled En Passant, a pilot home-shopping product from Apple Computer's New Media Division, EDS, and Redgate Communications. The multimedia CD-ROM uses video and audio to showcase merchandise from Lands' End, Williams-Sonoma, and other upscale businesses and is customizable so you can schedule critical gift-buying dates. Apple hopes it signals a new direction for retail shopping. For information on *future* editions, write to En Passant, Apple Computer, 20525 Mariani Ave., MS 81/MM, Cupertino, CA 95014.

HOW DO YOU REALLY FEEL ABOUT PERSONAL Communication Services (PCS), which offer the ability to reach and be reached anytime, anywhere? According to participants in Bell Atlantic Mobile's trial of its Personal Line cellular network, 24-hour reachability offers peace of mind, flexibility, and accessibility. For business use, it provides increased productivity, customer service, and flexibility. One key feature users demand is the ability to block out or accept only certain calls.

—Carol Levin

Focusing In On Computer Vision

THE DISTANT RUMBLING OF THE information highway running through our PCs is creating opportunities for innovative software makers to think up new tools to manage the impending onslaught of information. One path developers are taking is to extend traditional database methods for sifting through information and extracting useful data to encompass not only text and numbers, but also still images, sound, and video.

The problem of pattern recognition, or mathematically defining color, shape, texture, and other visual characteristics, is on the agenda of scientists at IBM's Almaden Research Center in California and at MIT's Media Lab in Cambridge. The focus of these efforts is to develop generalized algorithms for pattern recognition.

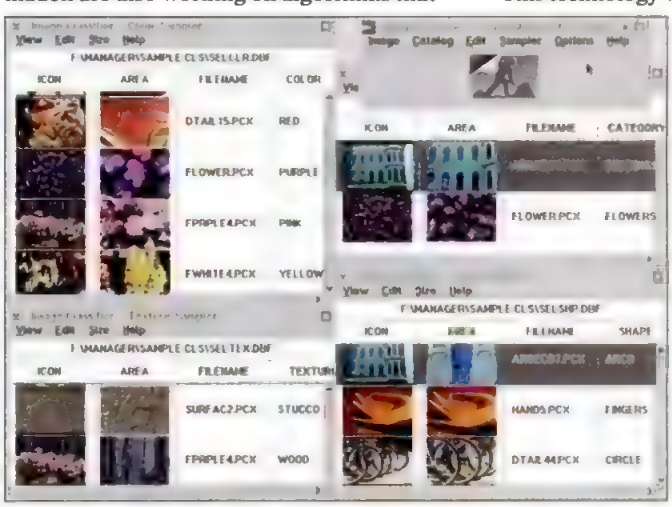
IBM's solution is a technology that lets you search on a variety of image attributes—color, texture, shape, and location. The idea is to take a sample of an image that's been scanned in, and use it as an example of the attributes you want to search for. So with a database of, say, images of fabric swatches, a clothing designer could search for fabrics with this season's color. Researchers at Almaden are also working on algorithms that search on sound and even support face recognition. At IBM's research lab in Tokyo, scientists are exploring *scene change analysis,* which analyzes streams of motion video.

When will this technology make it to the desktop? It's available now in IBM's new consumer software package, Ultimedia Manager, and IBM is also licensing the technology to database companies, photo houses, and CD-ROM image companies.

Back east, Professor Aaron Bobick of the MIT Media Lab is focusing his research on computer vision over time, so that sequences of images can be described in a way that you can later access. "The only way the information highway becomes powerful is if you can reach the technology to help you index and access information," says Bobick.

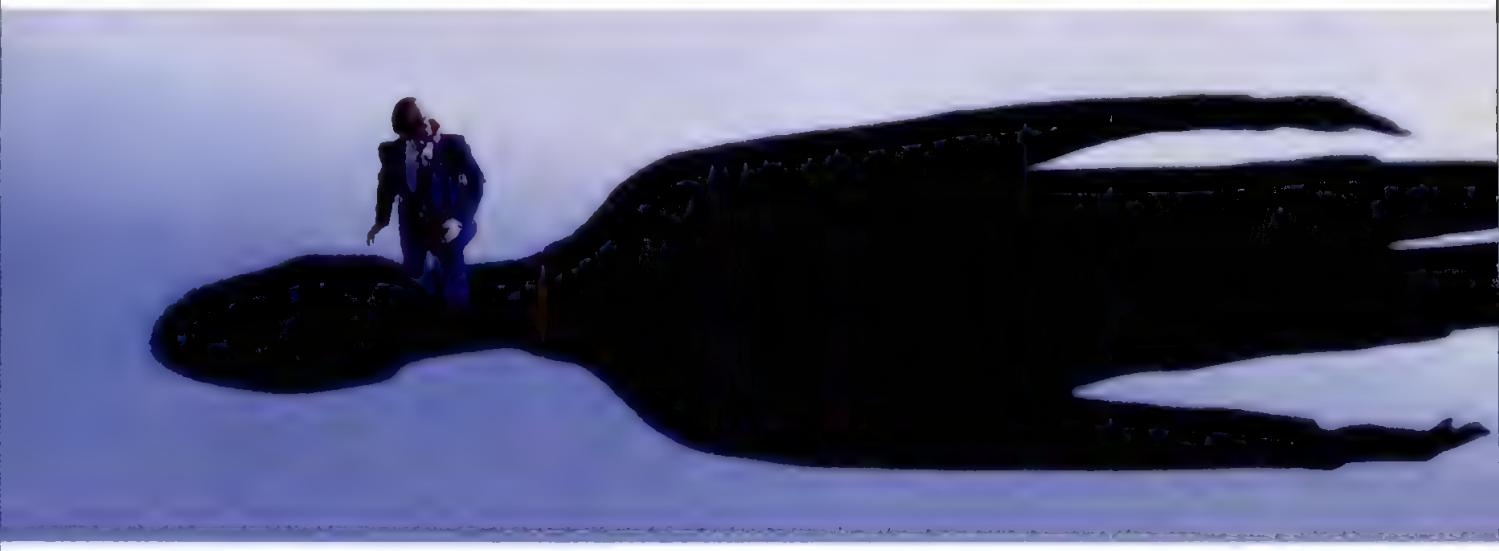
This technology will automate tasks that are now handled manually. A college football coach could query a video database to retrieve all plays that began on the 20-yard line. Extracting choreography from ballet is based on similar principles. "Interconnectivity is useless if you can't find what you want, if information is archived in a manner that you can't deal with in any useful way," explains Bobick.

—Carol Levin and Sheryl Canter



The product of image recognition research, IBM's Ultimedia Manager uses "Query By Image" to search for colors, textures, shapes, and images.

NOW IT'S EASY TO GET LOTUS NOTES BEFORE SOMEONE WITH LOTUS NOTES GETS YOU.



THE NOTES STARTER PACK GIVES YOU THE COMPETITIVE EDGE.

Right now, Lotus Notes® is providing thousands of companies, and over half a million users, with a huge competitive advantage.

Notes is the industry-leading workgroup application software that allows people to access, track, share and organize information in ways never before possible. It dramatically improves a company's everyday business processes by helping teams to work together in smarter, faster, more productive ways. Especially in the areas of Customer Service, Product Development, and Sales and Account Management where business is won and lost.

Independent research shows that the typical Notes installation pays for itself within three months and offers a three-year return on investment of over 400%.*

IT'S ALL IN ONE BOX.

The Lotus Notes Release 3 Starter Pack™ for Windows™ contains everything you need to get a full-powered Notes installation up and running in your company or department. It includes one Notes Server for Windows and two Notes Clients for Windows. Of course, additional client licenses can be added easily and inexpensively.

The Starter Pack also includes 25 of the most popular, ready-to-use business applications plus a video to help you get started fast.

All you need is Windows and a LAN.

HOW EASY IS IT?

Now getting and using Notes is easier than ever. Release 3 has an intuitive user interface and includes Lotus 'Working Together' features, such as SmartIcons® and a Smart Status bar, like those found on other Lotus applications such as 1-2-3® Release 4, Ami Pro® and Freelance Graphics.®

Once you get started, it's easy to expand your Notes installation at your own pace. Your Starter Pack is fully upgradable, and you can buy license packs in units from one to 100.

You can pick it all up with one hand, thanks to the convenient handle. And the whole thing costs less than $1000.

So stop by your Lotus Authorized Reseller or call **1-800-828-7086, ext. 9333** for a free demo disk. Put the power of Lotus Notes on your side. Before someone else does.

Lotus
Working Together®

In Canada, call **1-800-GO-LOTUS** ©1993 Lotus Development Corporation, 55 Cambridge Parkway, Cambridge, MA 02142. All rights reserved. 1-2-3, Freelance Graphics, and Ami Pro are registered trademarks of Lotus Development Corporation. Lotus Notes and SmartIcons are registered trademarks and Starter Pack is a trademark of Lotus Development Corporation. Windows is a trademark of Microsoft Corporation.
*"The Impact of Lotus Notes on Organizational Productivity," Prepared by Telesis, Providence, Rhode Island.

NEW! Lower Prices and VESA Local Bus Video!

The Complete Your Server.

To serve your LAN needs completely, you need a super-fast server. That's why we added VESA local bus to ZEOS® EISA systems–standard!

That's not all. We also increased the expansion slots to seven, giving you two VESA local bus slots and five 32-bit slots for either EISA or ISA expansion boards. And you now have the option to expand to 256MB of RAM on the motherboard and increase your hard drive to 2GB!

What's more, ZEOS EISA systems include a CD-ROM drive and 3.5" floppy drive–standard. For all the power you need, we're including 256K SRAM cache, Flash BIOS, Diamond SpeedStar SVGA local bus graphics card with Windows acceleration and a CPU upgradable all the way to Intel's Pentium™ OverDrive™ processor.

yes It runs with NetWare

Even better, your ZEOS system is 100% compatible with every major network operating system on the market. So get connected! Give us a call at 800-554-7172.

AWARD-WINNING SERVICE

We're the only company to win *PC Magazine*'s Readers' Choice for Service & Reliability, for both desktops and notebooks, *twice!*

We've also won *PC Magazine*'s Editors' Choice nine times. ZEOS is your best choice!

STANDARD WITH EVERY ZEOS EISA UPGRADABLE:

- RAM is expandable to 256MB.
- ZIF socket for CPU upgrades all the way to Intel's Pentium OverDrive processor.
- 256K SRAM cache.
- High-speed Diamond SpeedStar SVGA local bus graphics card with 1MB RAM (capable of 16.7 million colors).
- ZEOS 14" 1024 x 768 .28mm non-interlaced SVGA color monitor with tilt and swivel base.
- Ten-bay vertical case with two cooling fans.
- Two serial ports and one parallel port.
- Seven expansion slots: two VESA local bus, five 32-bit accepting both EISA and ISA expansion boards.
- System speed is keyboard selectable.
- 200 watt power supply with built-in surge suppressor, switchable between 115/230V.
- ZEOS 101-key space-saving keyboard.
- FCC Certified Class B; UL Listed.
- Complete ZEOS Customer Satisfaction Package.

SERVER 1

486DX-33 ..... **$2695**
Lease $98/month

486DX2-50 ..... **$2795**
Lease $101/month

486DX2-66 ..... **$2995**
Lease: $108/month

- 8MB RAM
- High-speed 452MB SCSI hard disk drive
- EISA Fast SCSI-2 controller card
- **2X CD-ROM drive** and 3.5" 1.44MB floppy disk drive
- Ergonomic Microsoft Mouse, Microsoft DOS 6.2 with Enhanced Tools, Windows for Workgroups 3.11

SERVER 2

486DX-33 ..... **$3395**
Lease. $112/month

486DX2-50 ..... **$3495**
Lease. $115/month

486DX2-66 ..... **$3695**
Lease: $122/month

- 16MB RAM
- High-speed 1GB SCSI hard disk drive
- EISA Fast SCSI-2 controller card
- **2X CD-ROM drive** and 3.5" 1.44MB floppy disk drive
- Ergonomic Microsoft Mouse, Microsoft DOS 6.2 with Enhanced Tools, Windows for Workgroups 3.11

Purchase orders are subject to approval. Business leasing programs available. Lease prices based on a 36-month lease, 10% purchase option. All prices, specifications and availability are subject to change without notice; call to confirm these and warranty details. Prices do not include shipping. Novell compatibility is Developer Tested Only. Novell makes no warranty with respect to this product. All products and company names are trademarks or registered trademarks of their respective holders. ZEOS is a registered trademark; Z-Card and Computers Now! are registered servicemarks. Ambra is a trademark of ZEOS International Ltd. © 1994 ZEOS International Ltd., 1301 Industrial Blvd., Minneapolis, MN 55413 USA. ZEOS is a publicly traded company (NASDAQ symbol: ZEOS). EILL-PCM-9401B

Network Solution.

Your Nodes.

ZEOS Ambra™ computers are not just another line of systems. They're the ultimate nodes or ideal home office computers. Why ultimate and ideal? What's new? On-board local bus video, larger system cache, larger hard drives and the option of a 486SX or 486DX microprocessor. Even better, our prices are lower!

Some things don't change –and don't need to. We include the same quality ZEOS components and many choice extras. Standard are an upgradable CPU, 128K SRAM cache for faster access, enough bays to add a 5.25" floppy, CD-ROM and tape backup, and five expansion slots–two on the local bus. All this in a space-saving slim case.

intel inside

It's a little powerhouse that's great for word processing or intense spreadsheets. Whether it's plugged into your network or plugging away at the home office, ZEOS Ambra™ computers are the sensible systems that won't cramp your style.

STANDARD WITH EVERY ZEOS AMBRA SYSTEM:

- 486SX or 486DX Intel microprocessor.
- Upgradable to Intel's Pentium OverDrive processor.
- 128K SRAM cache.
- On-board VESA local bus SVGA color video with 512K video RAM, upgradable to 1MB
- Two serial ports, one parallel port and one mouse port integrated on the motherboard.
- Five expansion slots: two VESA local bus, three 16-bit ISA.
- Small footprint case with four drive bays.
- System speed is keyboard selectable.
- 200 watt power supply, switchable between 115/230V
- ZEOS 101-key space-saving keyboard.
- Password feature built-in ROM for security.
- FCC Certified Class B; UL Listed.
- Complete ZEOS Customer Satisfaction Package.

PACKAGE 1

486SX-25 ..... **$1195**
Lease: $43/month

486SX-33 ..... **$1295**
Lease: $55/month

486DX-33 ..... **$1395**
Lease: $59/month

- 4MB RAM
- 214MB IDE hard drive with built-in 128K cache
- 3.5" 1.44MB floppy drive
- ZEOS 14" 1024 x 768 SVGA color monitor, tilt and swivel base
- Microsoft DOS 6.2 with Tools, Microsoft Windows for Workgroups 3.11 and two-button mouse

PACKAGE 2

486SX-25 ..... **$1495**
Lease: $63/month

486SX-33 ..... **$1595**
Lease: $58/month

486DX-33 ..... **$1695**
Lease: $61/month

- 8MB RAM
- 340MB IDE hard drive with built-in 128K cache
- 3.5" 1.44MB floppy drive
- ZEOS 14" 1024 x 768 SVGA color monitor, tilt and swivel base
- Microsoft DOS 6.2 with Tools, Microsoft Windows for Workgroups 3.11 and two-button mouse

TOLL-FREE SUPPORT & WARRANTIES

We're here for you 24 hours a day, 365 days a year, and always a toll-free call away. All ZEOS systems come with a One Year Limited Warranty, Express Parts Replacement and a 30-Day Money-Back Guarantee.

CALL NOW TOLL FREE

800-554-7172

Fax Orders: 612-633-1325, Government: 800-245-2449, TDD orders: 800-228-5389, Outside U.S. and Canada: 612-633-6131. Purchase Orders, MasterCard, VISA, Am Ex, Discover, Z-Card,™ COD and leasing programs. Open 24 Hours a Day, 365 Days a Year!

ZEOS INTERNATIONAL, LTD.

CIRCLE 038 ON READER SERVICE CARD

Competitive Upgrade Offer

In a perfect world, you wouldn't need OCR software as accurate and friendly

WordScan® Plus 2.0: OCR for the Real World from Calera.

WordScan Plus 2.0 is OCR for the real world. It reads virtually every document including faded photocopies and marked-up memos. It integrates seamlessly with familiar Windows applications. And it's easier to access and use than ever before.

Accuracy and Productivity You Can Count On

"Wordscan Plus 2.0 sports a polished Windows interface, top accuracy, and an abundance of productivity enhancements."
InfoWorld, November 1993

"Anyone who does OCR is looking for an OCR engine that reduces errors. Adaptive Recognition Technology, the core of Calera's Wordscan 2.0, does just that."
Imaging Magazine, September 1993

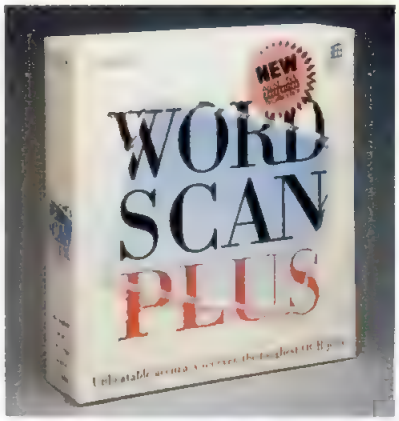
"Wordscan Plus 2.0 provides improved character recognition for poor quality documents such as faxes and photocopies. The result is an efficient and more accurate OCR program...Superior OCR technology."
PC World, November 1993

"After a long testing period with scanned documents, graphics files of various formats and faxes of incredibly poor quality, the verdict is that Wordscan Plus is an impressive product."
Personal Computer World, November 1993

"Easy to use OCR package with impressive ability to cope with poor quality images."
Personal Computer Magazine, November 1993

"If faxed documents were perfect, any OCR package could read them. But it's the fly tracks, smudged letters, and muddy photocopies that...put such a hit on productivity... Calera has...come up with a pair of OCR packages that offer greater accuracy..."
PC Computing, November 1993

CIRCLE 341 ON READER SERVICE CARD



Friendliness You'll Welcome

With WordScan Plus, you get an icon-based toolbar that takes full advantage of the user-friendly Windows operating environment you've come to appreciate. For support during OCR operations, simply refer to the helpful tool bar with its exclusive HoverHelp™ feature. Just point to any icon with your mouse and get a clear, concise explanation about the selected function.

The OCR Aware™ function in WordScan Plus lets you access complete OCR capabilities from *within* your favorite applications—without a lot of closing and opening of windows. And, WordScan Plus was the *first* OCR product to support Microsoft's OLE 2.0. Simply click on the image you want to OCR, then *drag and drop* the image to the WordScan icon or window.
Now *that's* friendly.

You can call on new fax support capabilities to view and OCR faxes. Then use the E-mail support feature to quickly route text or image documents—all without ever leaving WordScan Plus.

This is OCR for the real world. This is what you've been waiting for.

Publish '93 Readers' Choice Award

Buyers Assurance Seal

PC Magazine Editors' Choice

Imaging Product of the Year 1992

New Competitive Upgrade Offer!
OmniPage and other PC OCR software owners can upgrade for *only* $149!
Great pricing, limited time offer.

Call **1-800-224-0660 ext. 100** for complete details of this special offer or for the Calera dealer nearest you.

OCR FOR THE REAL WORLD
WORDSCAN PLUS 2.0

CALERA
RECOGNITION SYSTEMS

© 1993 Calera Recognition Systems. Calera and WordScan are registered trademarks. Adaptive Recognition Technology, OCR Aware and HoverHelp are trademarks of Calera Recognition Systems. All other products and brands are the property of their respective trademark holders. Offer valid in USA and Canada only.

First Looks

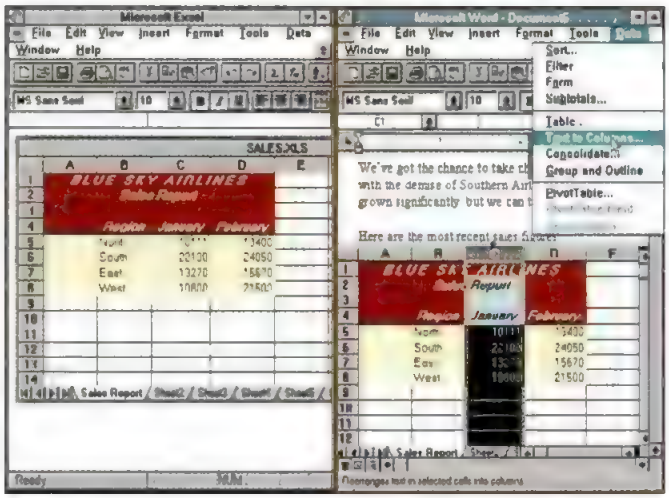
HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

A New Era in Integrated Software

Microsoft Office 4.0 Ties Apps Closer Together than Ever

BY GREGG KEIZER

While pundits were repeatedly giving notice that integrated software was dead and buried, something strange happened to full-featured applications: They were collected, then combined, into integrated packages. The latest entry in the suite skirmishes, Microsoft Office 4.0 ($750), may look at first glance like another attractively priced grab bag of business software, but Microsoft's attention to cross-application consistency and interapplication integration actually makes the package more like a muscle-bound Microsoft Works.



DOCUMENT-CENTRIC: *Integration is simplified within Office's applications. Here, Excel works within Word for Windows.*

This Windows ensemble, which will include Microsoft Word for Windows 6.0, Microsoft Excel 5.0, Microsoft PowerPoint 4.0, and Microsoft Mail 3.2 (with Access 1.1 added in the $899 Office Professional) when all those upgrades are finished, blurs the boundaries between applications better than any other available bundle.

We looked at a version of Office that didn't yet include the latest versions of Excel and PowerPoint. Users who buy Version 4.0 will be entitled to an upgrade when all the upgraded component apps are available. By late winter, all the pieces should be in place, and the new Office version number will be 4.2. (A First Looks evaluation of Microsoft Word for Windows 6.0 appears below, and a preview of PowerPoint appears on page 40. For a preview of Excel 5.0, see "Spreadsheet Software: Less Is More" in the January 11, 1994, issue of *PC Magazine*.)

INTEGRATED INTELLIGENCE

As early as during installation, Office shows some integrated intelligence. The Microsoft Office Manager (MOM) utility lets you install all or part of the suite at a single sitting (and what a sitting it is, with dozens of disks to feed to the drive). MOM will also clean up the hard disk, removing files associated with uninstalled elements. Its small

Continues on page 38

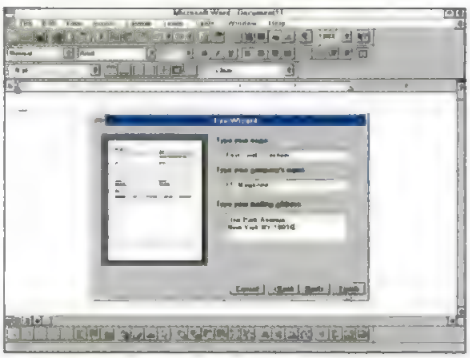
Word Processing as Never Before

Word for Windows 6.0 Gets Psychic

BY EDWARD MENDELSON

Microsoft Word for Windows 6.0 is the first word processor that helps you spend your time writing and organizing while the program does the tedious work of for- matting and correcting text.

At first glance, Microsoft's $495 package looks and acts much like Word for Windows 2.0 (Microsoft skipped three version numbers to bring the Windows version in line with the numbering of the Macintosh and DOS versions), but in reality, almost every detail of the program has been refined, clarified, and automated.



WIZARDRY: *Word's wizards format documents.*

Word for Windows doesn't have the overwhelming range of features found in WordPerfect for Windows 6.0 or Lotus Ami Pro 3.0's tight integration of graphics and text, but it does offer an almost ideal balance of power and convenience that no other program can approach. Compared with all rival word processors, Word for Windows

Continues on page 39

IN FIRST LOOKS

Magic 5.5.....42
Apple LaserWriter Select 360 and Pro 810.....44
Compaq ProLiant.....46
Five Mac-to-DOS utilities...50
Northgate ZXP-XL2/C.....51
On-Schedule for Windows 1.0a.....52
Screen Thief 1.50.....52
XyWrite for Windows 4.1..54
Pegasus PCI.....54
Random House Unabridged Dictionary, 2nd Edition.....56
Exide Powerware Prestige Model 1000 EXT.....56
Microcom DeskPorte FAST.....58
Autodesk 3D Studio 3.0.....58

Photography by Thom O'Connor

Microsoft Office

CONTINUED FROM PAGE 37

customizable toolbar lets you launch the suite's applications or switch among those that are already active. You can float this toolbar anywhere on the screen, then quickly toggle among different sections of Office.

Office's newest applications—Word for Windows 6.0, Excel 5.0, and PowerPoint 4.0—show dramatic improvements in consistency, a quality that encourages you to work with unfamiliar applications and eases transitions between programs. Eight of the nine top-level menu items in this trio are identical, and many of the items under those menus are grouped similarly. Likewise, the default toolbars in these three applications share a majority of their icons, which are relegated to the same relative position in each program. And customizing a toolbar—one of the things new to Word for Windows 6.0, for example—is completed using the same procedure.

Other marks of consistency include the redesigned dialog boxes, which work with a file-folder tab metaphor to group several similar options within one window. And each of the three pops up a context-sensitive menu at the click of the right mouse button.

LOOKALIKES: *Consistency within at least three of Office's applications—Excel, Word for Windows, and PowerPoint—starts with the menus.*

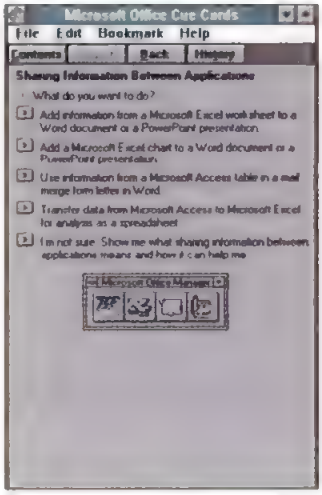
The Office applications share more than just a few menu items, though. Several key components, from the spell-checker to a query tool, are communal. If nothing else, this resource sharing cuts down on disk-space overhead.

NEWFOUND INTEGRATION

The real boon that Office brings to the desktop is the new-found integration among its applications. Lumped under the name OfficeLinks, this integration comes primarily from implementation of Object Linking and Embedding (OLE) 2.0, and is much more polished than the simple cut-and-paste and macro techniques that Lotus SmartSuite 2.1 now offers.

The slickest and simplest way to build a compound document within Office is simply to drag elements from one application's window into another. To move a table of figures or a chart from Excel to Word for Windows, for example, you select the cell range or chart, drag it to an open Word for Windows document, and drop it. Similarly, you can move an Excel chart into a PowerPoint presentation. It's typically faster, and certainly takes fewer steps, than the traditional Clipboard techniques.

Alternatively, you can insert elements from one application into another by using the toolbar. A click on an icon in the PowerPoint toolbar, for example, embeds an Excel worksheet directly into the presentation. Other buttons automate additional integration: One in Word for Windows exports an outline and creates a PowerPoint presentation, while one in PowerPoint inserts a Word for Windows table on the current slide.



HELP: *Microsoft Office Manager's floating toolbar is a fast way to jump among applications. Cue Cards help, too.*

In either case, OLE 2.0 keeps you in your primary document. When you double-click on one of these embedded objects, you're not presented with a separate window. Instead, the menu and toolbar change to reflect the object's own application. It's a striking change in something like Word for Windows, where selecting an Excel table or chart puts the latter's tools at your disposal for some quick editing. This document-centric approach streamlines the chore of assembling and revising reports or presentations that depend on figures and charts.

Office enhances integration in other ways. You can send mail directly from its applications, attach documents to that mail, and even generate routing slips so that those documents automatically cycle through a workgroup. And when you create a mail-merge within Word for Windows, you can obtain data directly from an Access database, an Excel worksheet, or any of several other supported programs.

MAKE LOTS OF ROOM

Sophisticated integration like this takes considerable disk space and computational horsepower. A full installation of Office's four pieces requires nearly 50MB of storage. Some tasks, such as drag-and-drop embedding, seemed slow on a 33-MHz 486 system equipped with 8MB of RAM. And it was sometimes difficult to run more than a pair of Office's applications simultaneously because of their system resource consumption. If you're serious about using Office as an integrated system, you should be running it on a fast 486 that has plenty of RAM and hard disk space.

Once you have the appropriate hardware to run it on, Microsoft Office blends its applications better than any other currently available software suite. In fact, it's the first one to provide something that is really much more than the sum of its parts. For power with an integrated edge, it has no peer today, though you can be sure that the integrated application battle is only beginning. □

FACT FILE

Microsoft Office 4.0
Microsoft Corp.; One Microsoft Way, Redmond, WA 98052-6399; 800-426-9400, 206-882-8080; fax, 206-936-7329.

List price: $750; Office Professional, $899; upgrade, $259; competitive upgrade, $299.
Requires: 4MB RAM (6MB recommended), 16.5MB to 48MB hard disk space (24.5MB to 62MB for Professional), Microsoft Windows 3.1.
In short: Microsoft Office not only adds new versions of Word for Windows, Excel, and PowerPoint to its suite, but with its cross-application consistency and considerable interapplication integration, actually blurs the boundary between those programs.
410 ON READER SERVICE CARD

Microsoft Word

CONTINUED FROM PAGE 37

lets you accomplish far more while working far less.

The most spectacular new features in Word use Microsoft's AutoSense technology to convert files that look as if they were created on a typewriter into fully formatted documents with headlines, bulleted lists, typographic quotation marks, and other features. Word's IntelliSense features automatically correct misspellings and expand abbreviations while you type (see the sidebar "Word's Sixth Sense").

Word's tables now use the same "autofit" technology that lets Excel adjust column widths to fit the data. Wizards ask how you want to format faxes, letters, agendas, tables, and other documents, and then create elaborate formatting for you. Word can shrink type size and spacing to make your text end near the bottom of a page instead of spilling over to the next—a feature that works well only on short files.

The interface boasts dozens of refinements, some of them unique. The right mouse button pops up context-sensitive menus that you can customize to include macros or other commands. You can rebuild the entire top-line menu system and customize or create floating toolbars (which annoyingly display only icons, not text).

The program automatically selects whole words when you drag the mouse over text. If you hold down the Alt key while using the horizontal and new vertical ruler, you see a display of the distances between tabs, columns, and margins.

SEE IT YOUR WAY

Icons let you jump between page, draft, and outline views, and all views are editable—including a multipage view that shows up to 55 pages on a 1,024-by-768 display. Page breaks and other breaks are marked by name on-screen; layout features that you can't edit without going first to a menu or icon are grayed out. Word's cursor slants in italic text so you're never in doubt about where the next character will appear.

Word is one of the few programs that lets you edit different parts of the same file in separate windows. You can also drag text and most graphics between windows, and the long-awaited support for Windows' Multiple Document Interface lets you iconize files. The status bar lets you turn on macro recording and other functions with a mouse click, although you can't customize the status bar or other screen features as extensively as you can in WordPerfect for Windows.

Separate applets in the package create equations, graphics, charts, and the shadowed and curved text that Microsoft calls WordArt. The equation editor, based on Design Science's MathType, is more flexible than Ami Pro's and far superior to the code-based editor in WordPerfect.

The graphics module, although generally weaker than WordPerfect's, supports an ingenious "callout" feature that draws a line from a point in a table or graphic to an annotation. Word accesses these applets via Object Linking and Embedding (OLE), and because Word and most applets support OLE 2.0, the graphic displays in the same window with the rest of the page. Similar OLE 2.0 support due in Excel 5.0 lets you drag spreadsheets and charts between Excel and Word.

THE GOOD AND THE BETTER

Other improvements include an awkwardly implemented 100-level Undo that is still vastly superior to the Undo functions in everything except DeScribe for OS/2. The Find menu has a "sounds-like" option that lets you search for text you don't remember how to spell, and a pop-up list lets you search for nonprinting characters without entering obscure codes.

Document comparison features are stronger than in WordPerfect, and Word, unlike WordPerfect, supports on-the-fly redlining with advanced options for group editing. Word's support for text-based desktop publishing features like dropped capitals is stronger than WordPerfect's, although Word lacks WordPerfect's gradient fills, image enhancement, and built-in scanner support.

Most of Word's advanced formatting features are effort-

FACT FILE

Microsoft Word for Windows 6.0

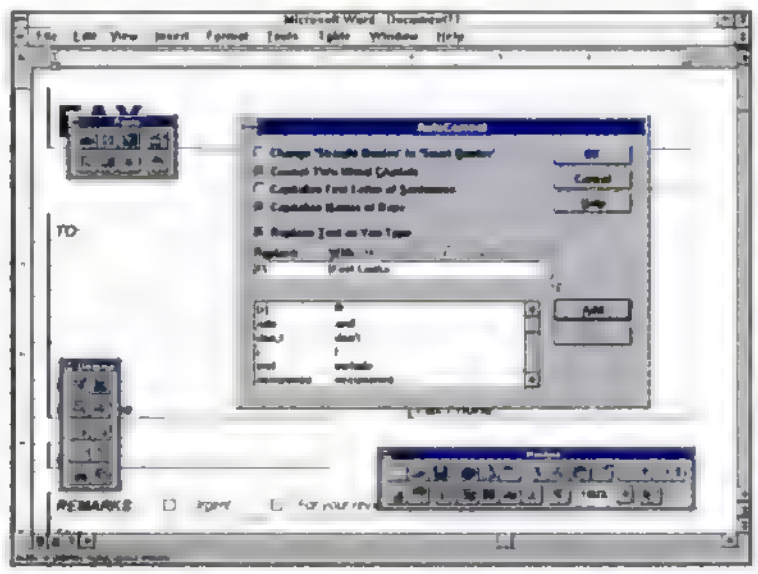
Microsoft Corp., One Microsoft Way, Redmond WA 98052; 800-426-9400, 206-882-8080; fax, 206-936-7329

List price: $495; upgrade, $129
Requires: 4MB RAM, 18MB hard disk space, Windows 3.1 or later.
In short: The automated correction and formatting features in Word for Windows 6.0 are a radical advance in word processing technology, and the program as a whole is sleek, efficient, and more convenient to use than any other word processor. Word is designed to work tightly with Excel 5.0 and other applications in the next version of Microsoft Office.

409 ON READER SERVICE CARD

Word's Sixth Sense

Microsoft's IntelliSense technologies are designed to figure out what you want to do in your work and then offer to do it for you. In Microsoft Word for Windows 6.0, IntelliSense operates through two significant features: AutoCorrect and AutoFormat. Both are optional and customizable.



AUTOMATED: *Word 6.0 can automatically correct your spelling mistakes on the fly.*

AutoCorrect corrects as you type. All you do is fill in a table in which the first column includes your most common typing errors or shorthand abbreviations, and the second column includes the correct spellings or the full text that you want the abbreviation to expand to. If you don't know the correct spelling of a word, you can add a correction pair when Word flags your error during a spell check. AutoCorrect can also insert "curly" quotes as you type and fix capitalization errors on the fly. Some AutoCorrect features are built into The Technology Group's XyWrite 4, but Word's implementation is far superior.

AutoFormat formats after you type or import your text. Start, for example, with an e-mailed file that includes returns at the end of each line, and AutoFormat transforms it into a fully formatted document with centered headlines, bulleted lists, and no empty paragraphs or excess spaces. The results aren't perfect, but they're astonishingly good, and you can format your document with any supplied stylesheet or any custom stylesheet—as long as you use Word's standard names for heading and text styles.—*EM*

Preview: PowerPoint 4.0

When the Microsoft Office suite is complete, it will include not only Word for Windows 6.0 and Excel 5.0, but also Version 4.0 of PowerPoint. Here's a preview.

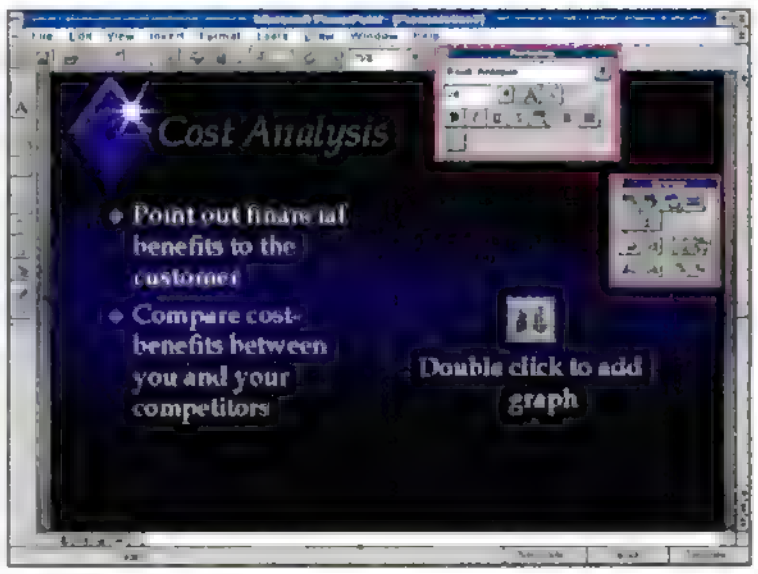
Though the latest version of Microsoft's powerful presentation graphics program isn't festooned with dozens of new features, its interface facelift and its new approach to presentation creation make it much more flexible and usable.

PowerPoint will operate almost identically to the new versions of Word and Excel, right down to the icons, tear-off toolbars, context-sensitive mouse button menus, and multiple-attribute dialog boxes.

Microsoft's popular Wizards, intelligent macros that help automate tedious or confusing tasks, also appear in PowerPoint 4.0. The AutoContent Wizard gives confused presenters a boost by automatically generating a presentation with a canned outline based on the type of presentation you tell it you're giving. For instance, if you choose "Recommending a Strategy," the outline tells you that slide two should contain statements about your objective.

Another Wizard helps you "Pick a Look" by narrowing down your template choices based upon the output device. It also helps you automatically generate footnotes, headers, and other auxilliary text for handouts and speakers' notes.

Microsoft has adopted the "Click here to enter..." metaphor made popular by Lotus Freelance Graphics for Windows, and that makes jumping in and getting started on a presentation even easier. To help you over whatever's left of the learning hump, the program offers Cue Cards—step-by-step help for ten common operations.



FRIENDLIER FACE: *PowerPoint 4.0 will feature several ease-of-use improvements.*

The few new features that have been incorporated looked well-implemented and very useful in the prelease version we saw. From a strict productivity perspective, the most important change is PowerPoint's adoption of page layouts. The program's AutoLayouts function operates slightly differently than in other presentation packages. There's still one master slide with which you set the background, slide title, and object area. Once those are defined, you choose different AutoLayouts (such as a slide with a title, bullet list in the left column, and a chart in the right); the program automatically configures bullet charts, graphs, and symbols to fit within the object area. The AutoLayouts work well and PowerPoint offers a broad variety, but you can't create custom layouts.

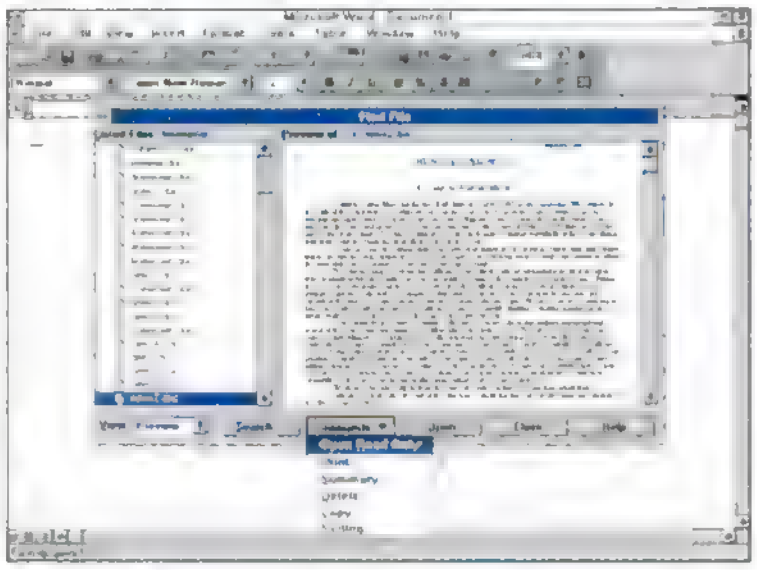
PowerPoint 4.0 also includes a great Word-like Document Summary dialog and file-search capabilities (such as the ability to search across files for words that occur anywhere in the presentation). You'll also find text rotation at any angle, the ability to hide slides during electronic presentations, and color palettes kept separate from the color scheme.

Keep in mind that PowerPoint does have many new capabilities that are not implemented within the package itself but rather in much-improved OLE servers, especially MS Graph and the Clip Art Gallery.

This new generation of PowerPoint will definitely outshine its parent when it comes to ease of use and presentation management, and will compete admirably with the current generation of software on the market for creating most nonspecialty presentations.—*Lori Grunin*

less when compared with WordPerfect's, although Word still presents minor frustrations. You can save a custom bullet or numbering scheme as a style, but you won't see your scheme displayed if you return to the numbering menu, and the manual doesn't explain that you access your scheme by choosing Modify without selecting any of the displayed schemes. Other irritations are options menus that change according to the view mode, so you search helplessly while in Page View for features that you used 5 minutes before in Normal view.

Word's tools for creating forms far surpass those in any other word processor. You use a menu to create fill-in boxes, tables that automatically calculate results, and even drop-down lists of preselected options—entirely without programming. Every form field can have user-defined help text attached to it that will appear whenever the user presses F1. Microsoft improved Word's mail-merge function with automatically created data entry windows, "live" previews that let you leaf through the finished merge letters before printing them.

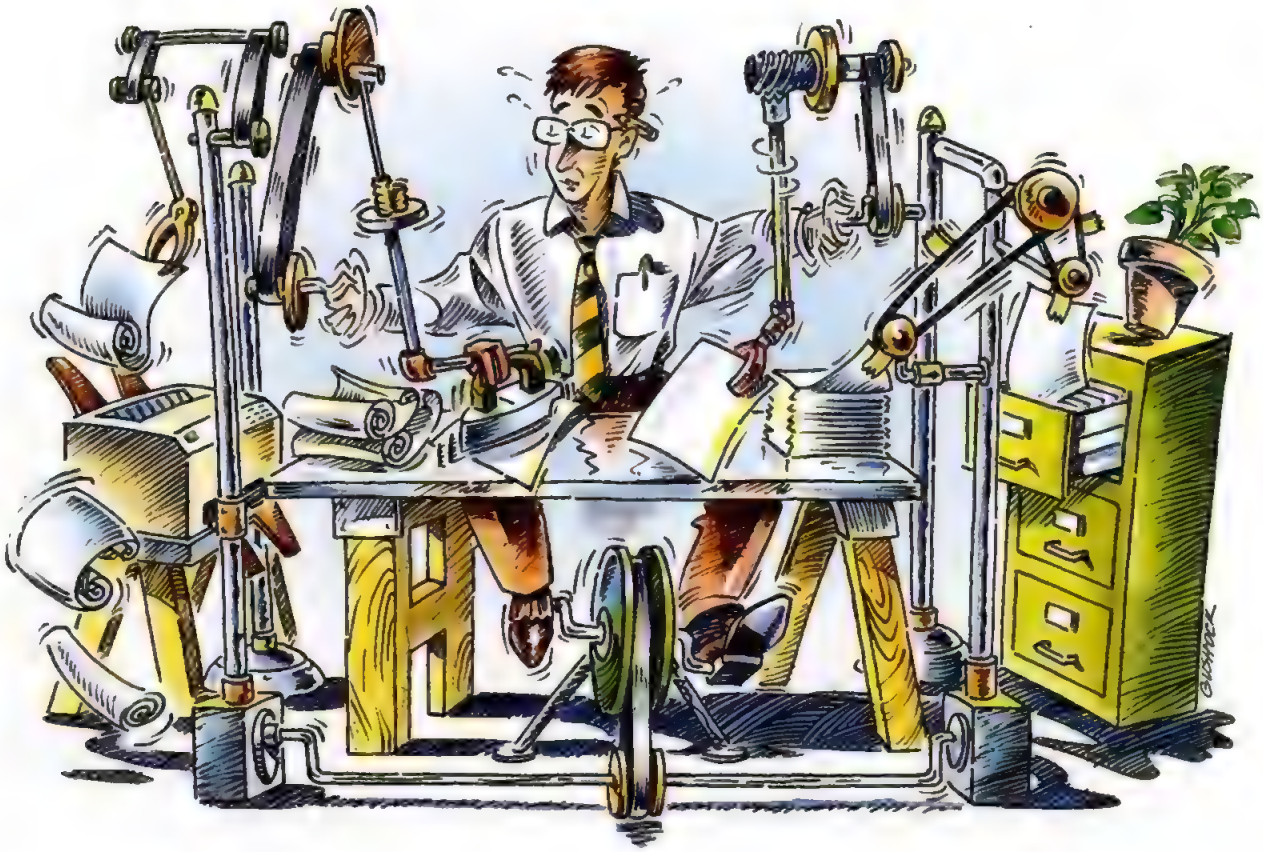


PREVIEW: *Word for Windows' file finder displays fully formatted documents.*

Microsoft hopes to encourage defections from WordPerfect through enhanced two-way conversion of WordPerfect 5.x files. Word's conversions, although exceptional, aren't perfect: Cross-references to paragraph numbers are converted to plain text that cannot be updated, and text that is pushed into the margin by WordPerfect's margin-release feature disappears from imported files.

Word is generally faster than WordPerfect, uses fewer system resources, and needs 4MB RAM instead of WordPerfect's 6MB. Word's first release is notably more solid than WordPerfect's, which is prone to crashes on some systems. Word lacks WordPerfect's advanced file management, disk indexing, and support for nonstandard characters, and its interface isn't as intuitive as Microsoft wants you to believe. But Word's unique automation features, its speed, elegance, and reliability, and the tight integration scheduled to link Word and the forthcoming Excel 5.0 all combine to make Word a superb word processor and one of the most effective and intelligent programs ever written. □

You too can build your own alternative to Fax and Find.



Sure, as long as you don't mind pedaling all day. But for those who want to solve their fax, paper document, and electronic file management problems in real time without breaking a sweat, there's Fax and Find,™ from Caere.

Fax and Find integrates the best-selling Windows™ fax software, WinFax PRO,™ with the leading document management program, Personal PageKeeper,™ in one easy-to-use solution. So now you can not only manage your faxes, but also automatically index, organize, and retrieve information from scanned documents and other files on your hard drive. Anything else is just spinning your wheels.

Call us today at **1-800-535-SCAN** for the name of your nearest Caere dealer or for more information about Fax and Find.

caere

For Your Information.

Caere is a registered trademark of Caere Corporation. Caere logo, Personal PageKeeper, and Fax and Find are trademarks of Caere Corporation. WinFax PRO is a trademark of Delrina (Canada) Corporation. Windows is a trademark of Microsoft Corporation. ©1993 Caere Corporation. All rights reserved.

CIRCLE 292 ON READER SERVICE CARD

■ Application Development

Magic 5.5: Programming Without Code...Sort Of

BY STEPHEN W. PLAIN

The latest release of Magic Software Enterprises' Magic—Version 5.5—adds needed functionality to this unique client/server development tool but does little to make it easier to use. Magic is priced at $2,000 for a multiuser DOS-based version, and versions are available for Unix as well. Because of Magic's flexible database-independent features, you can create client/server applications on your PC and deploy them later to a client/server configuration.

Magic comes with Novell's Btrieve database engine, and with the appropriate MagicGate gateway product it can access c-tree, DEC RMS, Informix C-ISAM, NetWare SQL, Oracle, Rdb, Sybase, and Xbase as well. A runtime version can be distributed with a finished application.

TABLE-DRIVEN PROGRAMMING

Magic is known for its "codeless" table-driven programming environment. While it's true that no traditional coding is required to build a Magic application, you still have to program. You build Magic applications by defining the various tables that make up each layer of the app. First you define data types, data files, and field and key formats, and then programs and help screens.

The CUA-compliant interface lets you scroll easily through the various tables, and a Zoom feature drills down a layer to list available objects for insertion into the currently selected table. Magic requires quite a bit of organization on the part of the programmer, since there is no easy way to look at the structure of an entire application. As a result, fully understanding another programmer's application takes a bit of poking around.

FIRST LOOKS PLUS

From January 10 through January 14, you can go on-line to discuss Magic with Stephen W. Plain and Magic's VP of products, Miko Hasson. Type GO EXEC from any CompuServe prompt.

EMBEDDED SQL

New to this version of Magic is support for embedded SQL, giving you the ability to use the powerful SQL language directly within a Magic application. Previously, Magic used SQL only under the covers to access SQL database servers. In order to use the SQL Command feature, however, you must be coding against a SQL database at the time, not the included Btrieve server. A SQL Assistor dialog has been added to aid in the creation of SQL commands. This dialog displays the SQL keywords, operators, tables, and columns, and lets you build complex SQL statements fairly easily. The complete SQL syntax is displayed as you construct it.

Also added to Magic 5.5 is collaborative programming support. Multiple programmers can now access the Magic environment simultaneously to work on the same project. Various locks are automatically applied to dependent objects to prevent another programmer from changing them while you're working on a higher-level object.

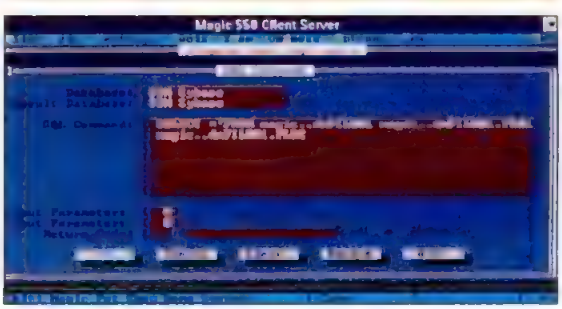
Magic now uses a rights-based system of security that is similar to NetWare's. Various levels of authorization rights such as Create, Modify, Delete, and Execute can be assigned to each developer for each type of element in an application. For security control over end users, a supervisor can create groups of users based on similar authorization levels.

Magic makes it easy for you to migrate data from one data source to another. If you change the database type and physical location entries in the files table, data moves to the new location automatically. This lets developers easily scale up an app to a higher platform.

NO DEBUGGER

Aside from the inability to view a complete application structure, we also found development in Magic to be a bit like walking a tightrope without a net. There is still no debugger in the product, and we experienced numerous situations where an internal error would simply drop us out to a C: prompt with an error message. Magic comes with both a real-mode version for limited-memory situations and a 386 version. Many of the problems we experienced were related to out-of-memory conditions in the real-mode version.

Magic Software has plans to develop a Windows version of Magic this year, as well as a GUI deployment system that will use the same control file produced by the current version of Magic to run an app under Windows. The company has also introduced Magic-NLM, a version of Magic that will run Magic apps under the Novell 32-bit network operating system. While it is not as smooth an environment as PowerBuilder or SQL Windows, Magic is an extremely structured environment that lets developers familiar with its style create front-end applications quickly. □



NO TRADITIONAL CODING: *In Magic, you define tables that correspond to the layers of your application, defining data types, data files, programs, and help screens.*

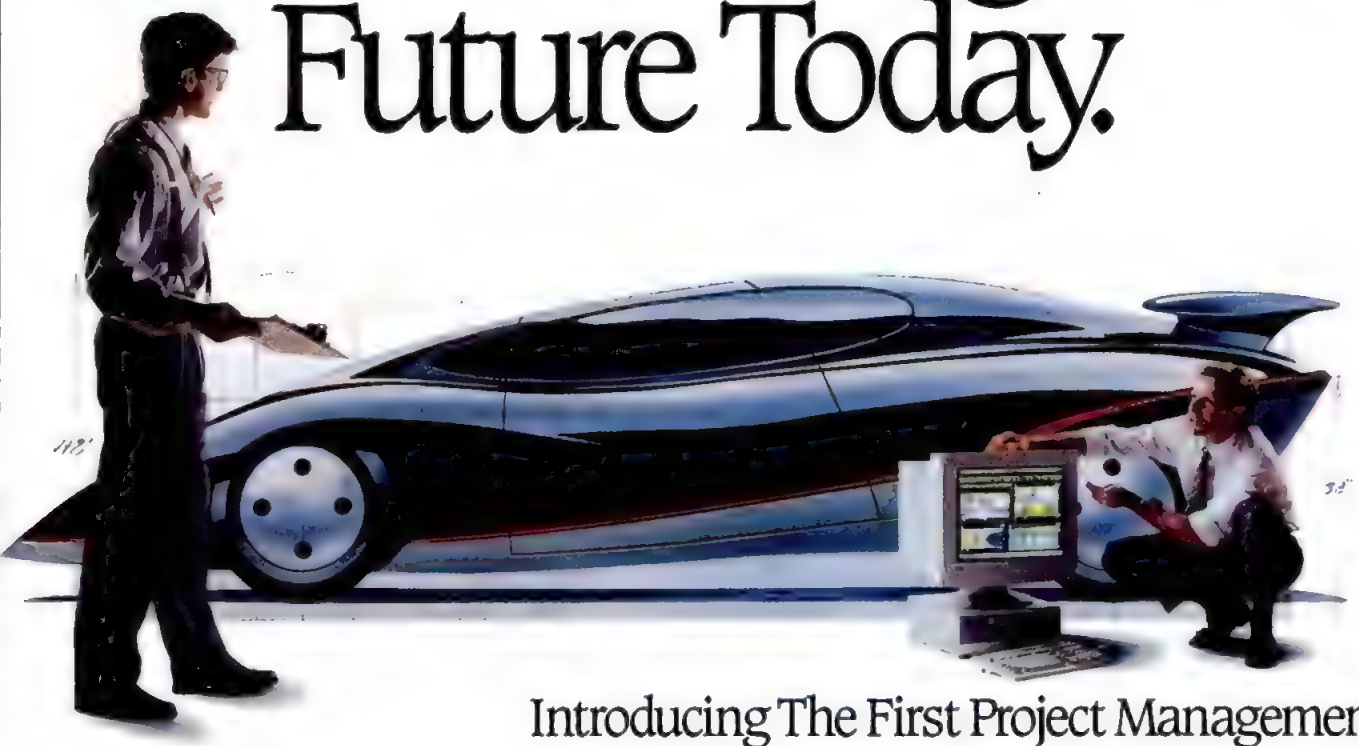
FACT FILE

Magic, Version 5.5
Magic Software Enterprises Inc., 1200 Main St., Irvine, CA 92714; 800-345-6244, 714-250-1718; fax, 714-250-7404.

List price: Multiuser, $2,000; single-user, $800, runtime version, $200
Requires: 640K RAM, 3.5MB hard disk space, DOS 3.1 or later.
In short: Magic is a table-driven, DOS-based client/server development package that lets you create applications rapidly without traditional coding
430 ON READER SERVICE CARD

Switch To CA-SuperProject For $149 And Get TimeSheet Professional® For Free.
For A Limited Time. Save More Than $600.

How To Manage The Future Today.



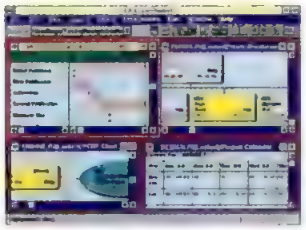
Introducing The First Project Management Software Everyone Can Use.

Beginners Love It Because It's So Easy.

Only CA-SuperProject™ offers a special Beginner Configuration with simple, easy-to-understand menus and an on-line "PM Assistant" that walks you through procedures and teaches the basics of project management. Lots of sample data and excellent tutorials make it fun to learn and super easy to use.

Experts Love It Because It's So Powerful.

CA-SuperProject has all the flexibility and power you need to manage extensive projects without any constraints. It's more sophisticated, more effective and, according to NSTL (*Software Digest*), it's the "best program for users who require a very powerful project manager with the most complete tools for modeling and managing resources, analytic functions and the most efficient resource leveling available."*



MICROSOFT WINDOWS COMPATIBLE

Buy one version, get the other FREE.

To Order, See Your Local Dealer Or Call 1-800-225-5224, Dept. 62007

Call now to find out how you can manage your projects efficiently. CA-SuperProject and TimeSheet Professional from Timeslip Corporation – the best way to manage your future today.

COMPUTER ASSOCIATES®
Software superior by design.

CIRCLE 193 ON READER SERVICE CARD

New CA-SuperProject 3.0

*Software Digest, Vol. 10, No. 4, 1993. Software Digest is a registered trademark of NSTL, Inc., a McGraw-Hill Co. Dealer prices may vary
© Computer Associates International, Inc., Islandia, NY 11788-7000. All product names referenced herein are trademarks of their respective companies

■ Laser Printers

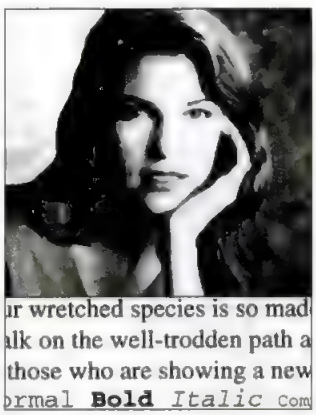
Apple's New LaserWriter Approaches 10 Pages per Minute

BY ALFRED POOR

The Apple LaserWriter Select 360 combines good looks, strong performance, and flexible features—as well as Windows fluency—at a price low enough to make it a competitive choice in a crowded market.

The list price of $1,599 places this printer a bit above most 8-page-per-minute desktop printers, but its 600-dot-per-inch Fuji Xerox engine is rated at 10 ppm. You don't get just HP PCL 5 emulation, either; there's true Adobe PostScript Level 2 support with a full complement of 35 fonts. This is no stripped-down model. It has 7MB of RAM (expandable to 16MB) and is driven by a 16-MHz AMD 29200 RISC processor.

The parallel, serial, and LocalTalk ports are all active simultaneously, and all three can automatically switch between PostScript and PCL emulation based on the data that arrives from the computer. You also get two 250-sheet paper trays, and a manual feed slot that can also take a multisheet feeder. There are optional bottom trays available in 250-sheet and 500-sheet capacities, and an optional PostScript Fax card that lets you send and receive faxes.



OUTPUT: *Some dropout is visible in areas of solid black.*

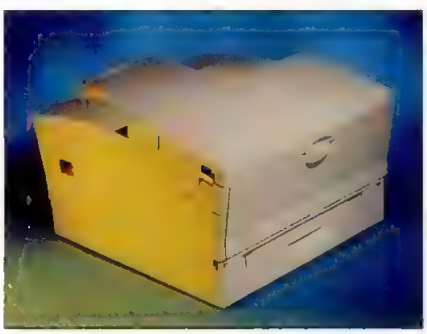
The Select 360 has a sleep mode for idle periods, which lowers power consumption to a maximum of 20 watts, making it Energy Star–compliant. The one-piece toner and drum cartridge is rated for 4,000 pages, and the printer is rated for a 300,000-page life.

SOFTWARE ASSISTANCE

Though the box contains a stack of Macintosh disks, including 29 additional downloadable fonts, PC users will be more interested in the single DOS disk. In addition to drivers for Microsoft Windows 3.0 and 3.1, the disk includes a special Windows utility program that you can use to configure the printer. This is handy, since the printer itself has no controls other than a power switch and no front-panel message window. The Windows utility lets you set features, such as the time delay for the power-saving feature, print density, and more.

How fast and how well does the Select 360 put data on paper? Under PostScript, the printer almost achieved its rated 10 pages per minute, hitting 9.16 ppm on PC Magazine Labs' Text Speed Test printer benchmark tests. PostScript graphics at 600 dpi came in at 0.81 graphics page per minute (gppm).

The PCL 5–emulation mode slows speed somewhat; the text speed in that mode dropped to 7.29 ppm. The PCL Graphics Speed test didn't take advantage of the PCL 5 bitmap compression mode, so the graphics speed of 1.7 gppm is the minimum you can expect in this mode. The printer supports only 300 dpi under PCL, however, so you'll want to use PostScript for the best printouts.



SELECT 360: *Suprisingly powerful.*

The print quality was good but not great. There was some dropout in large areas of solid black, and there was occasional vertical ghosting of the image from one part of the page to the next. On the other hand, the printer passed the PCL Torture Tests for compatibility without a hitch.

If you need a midspeed printer for single-user or small-workgroup use, especially in a mixed Mac and PC environment, the LaserWriter Select 360 makes an affordable and attractive choice.

• List price: *Apple LaserWriter Select 360, $1,599. Apple Computer Inc., 20525 Mariani Ave., Cupertino, CA 95014; 800-538-9696, 408-996-1010.*

Circle 435 on reader service card

▪ Apple's Network LaserWriter

If you need a printer with network horsepower, consider the LaserWriter Pro 810. With a list price of $4,899, it's designed for LAN installations; it even comes with a standard Ethernet interface.

The Fuji Xerox XP 20 engine is rated at 20 pages per minute, and the printer comes with both Adobe PostScript Level 2 and PCL 4 emulation (LaserJet IIP). There are 35 PostScript fonts in ROM, and the printer supports up to 800-dpi-resolution output. It takes three adjustable paper trays, which each hold up to 250 sheets of 11- by 17-inch paper.

PRO 810: *Three adjustable trays.*

There are a few caveats, however. The printer has only serial, LocalTalk, and Ethernet connectors; the absence of a parallel port makes it difficult to connect to a single computer. And the Ethernet-interface configuration requires some technical expertise as well as special cables, making it more difficult to set up than some other network printers.

It's not as flexible or as easy to use as the single-user LaserWriter Select 360, but the Apple LaserWriter Pro 810 does have the paper handling and speed necessary for large, heavy-duty network installations.—*AP*

Stylish Big and Tall Monitors from ADI. Make a Fashion Statement.

To complete your computer ensemble, try on a high-tech, high-fashion ADI monitor.

Our MicroScan™ 14-, 15- and 17-inch models elegantly display just about any mode. Everything from VGA, SVGA and XGA to VESA–up to 1280 x 1024, non-interlaced. All conveniently tailored to your liking by fingertip front-panel controls. And with built-in microprocessor intelligence and 18-mode memory, these high-quality monitors automatically remember the screen look you selected–size, centering and geometry.

For color-coordinating your output, nothing compares with this line. It lets you digitally fine-tune the red, green and blue hues on your CRT for precise WYSIWYG color matches. And its 72-Hz scan rate gives you refreshingly flicker-free images. Plus it meets all major international EMI and ergonomic standards.

To make *your* fashion statement, call **(800) 228-0530** for an ADI dealer showroom location. Whatever size you need, be sure to ask about our special program on big and tall 15- and 17-inch models. For faxed product information and editorial review, dial **(800) 767-8182.**

March 16, 1993
ADI MicroScan3E+

PC MAGAZINE EDITORS' CHOICE

ADI Systems, Inc.
2115 Ringwood Avenue
San Jose, CA 95131

To Order Call:
1(800) 550-9886

All company and/or product names are trademarks or registered trademarks of their respective owners.

CIRCLE 226 ON READER SERVICE CARD

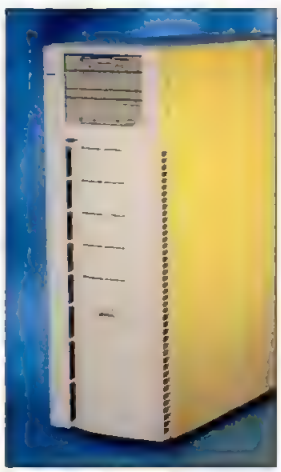
■ PCs

Compaq's ProLiant: Server Power

BY AMARENDRA SINGH

Compaq's new line of network servers, dubbed ProLiant, is being marketed as a replacement to the venerable Systempro XL series. Having already positioned its Prosignia line as a low- to mid-range solution, Compaq is targeting the ProLiant series for the higher end.

There are three ProLiant series, the 1000, the 2000, and the 4000, each designed to meet different network throughput requirements. They range from a single 486 processor design at about $6,000 (the 1000) to a four-Pentium configuration at about $14,000 (the 4000). The model we looked at was an $8,900 ProLiant 2000 with both one and two 66-MHz Pentium processors installed.



TOWER: *With 11 bays.*

EXPANSIVE INSIDE

The ProLiant was certainly designed with expansion in mind. There are five half-height drive bays for hot-pluggable drives, three additional bays for removable media, a one-third height bay for a floppy drive, a bay for a CD-ROM drive, and another bay for a tape drive.

The motherboard integrates two serial ports, one parallel port, a video port, and a SCSI port with both internal and external connectors. While onboard SCSI is great, RAID users will want to get Compaq's Smart SCSI array controller, which supports RAID levels 0, 1, 4, and 5. That controller has 4MB of cache, which can be used to control up to 10.5 gigabytes of disk storage internally. It takes up one of the eight bus-mastering EISA slots.

Network interface cards go in the other EISA slots, and there are three additional slots, all proprietary: One is for an additional CPU, one is for memory expansion, and one is a proprietary modem slot for remote management and problem notification.

Memory on the ProLiant is expandable from 16MB (on 486 models) and 32MB (on Pentium models) up to 512MB of Advanced Error Correction Code memory, although the system uses relatively inexpensive industry-standard 32-bit SIMMs. Each processor board also has 256K of Level 2 CPU cache, implementing Compaq's ServerCache-2 architecture. The system itself uses Compaq's TriFlex memory architecture.

The ProLiant comes with SmartStart, four CD-ROM disks containing popular network operating system software. Novell's NetWare, SCO Unix, and Microsoft Windows NT Advanced Server are included, while IBM's LAN Server is absent. To make use of the software, you have to buy an activation key to make it run.

GREAT PERFORMANCES

On our new ServerBench performance tests, the ProLiant was an excellent performer, especially when we added the second Pentium processor. Of all the subsystems, throughput seemed to benefit the least from the addition of a second CPU. With a single CPU, the system peaked at about eight clients and then maintained a balanced number of transactions. A great deal of the excellent network performance can be attributed to Compaq's Net-Flex 2 boards.

Disk performance was greatly improved by the second processor, and so was processor performance, as you'd expect. As part of the benchmark test scoring we also ran a mixed test consisting of interspersed disk, processor, and network tasks. In these tests, the ProLiant balanced the load well. No single subsystem was compromised for overall performance.

Compaq focuses on fault tolerance and failure prediction and recovery in the ProLiant series with a number of system-management features, including Compaq's Insight Manager 2.0.

Through a combination of firmware and hardware, the ProLiant monitors system thermal conditions, memory errors, and disk performance and status, and reports network errors such as lost frames, frame copy errors, and alignment errors. When the system detects errors, it can notify the administrator, shut the system down, and activate backups. Disk corrections run in the background, a second CPU board can take over, and administrators can get the message via the optional beeper notification package.

Insight Manager is used for remote maintenance and diagnostics both over the network or by modem from a remote site. It also handles fault, performance, and configuration management for the various Compaq-designed devices in the system.

Compaq has certainly done well in establishing the ProLiant as a contender in the mid- to high-end of the LAN server market. Though its great performance doesn't come cheaply and the disk subsystem could use some improvement, administrators looking to move applications off of minicomputers should take a good look at the entire ProLiant family.

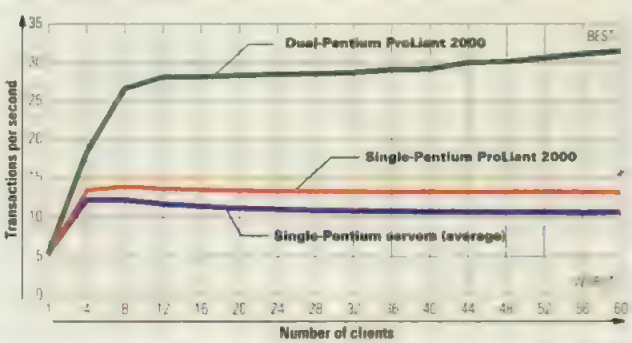
• List price: *Compaq ProLiant 2000, $8,900. Compaq Computer Corp., P.O. Box 692000, Houston, TX 77269; 800-345-1518, 713-370-0670.*

Circle 434 on reader service card

Benchmark Tests: ProLiant 2000

We tested the Compaq ProLiant 2000 with both one and two 66-MHz Pentium processors installed, increasing the number of workstations from 1 to 60. Both the average Pentium-based server and the one-Pentium ProLiant 2000 achieved peak performance with a load of 8 workstations. The dual-Pentium ProLiant's throughput, however, continued to improve all the way through a load of 60 workstations.

Ziff-Davis Benchmark Operation's ServerBench 1.0, a subsystem-level benchmark test that runs under SCO Unix, simulates a variety of tasks being run on several workstations in a workgroup environment. We time the PC as its processor/memory, disk, and network subsystems perform this series of operations.

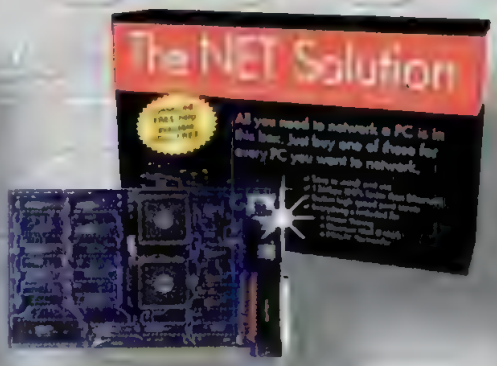


The NET Solution™

New breakthrough LAN offers higher performance, with much less complexity, at a lower cost.

Easy to Install and Use

- No switches or jumpers to set.
- No on-site technical staff or contractors needed.
- Fits right in with your existing PCs, software, *and people.*



12 Mbps

- Faster than ARCnet *and* Ethernet!
- Built-in high-speed print server.
- Up to 254 users possible.

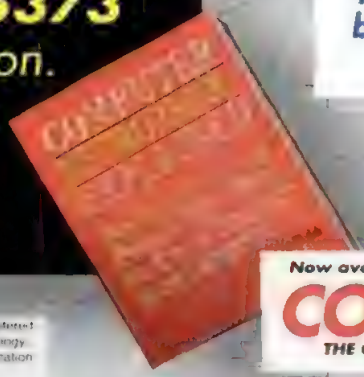
No Network Software Needed

- Intelligent cards form a network right out of the box, providing printer sharing, E-Mail, and PC-to-PC file transfer services.
- You may also use a NOS like **Novell NetWare, Windows for Workgroups**, or **LANtastic**, for file sharing where needed.

Uses UTP wire, but no hub is needed!

- Uses the popular *unshielded twisted-pair* wire (only one pair!).
- Simple daisychain-style wiring.
- Optional hub available if you want a star topology.

Call **800-433-5373** for more information. A FREE handbook on networking is also available.



This is the FASTEST network you can buy off the shelf. It's also the easiest to install. There's nothing better!

CONNEXPERTS®
The connectivity experts...

Now available at...
COMPUSA
THE COMPUTER SUPERSTORE

(214) 233-8800
FAX (214) 239-6490

©1993 by Applied Creative Technology, Inc. | CONNEXPERTS is a registered trademark and NET Solution is a trademark of Applied Creative Technology, Inc. Other product names mentioned herein have been used for identification purposes only and may be trademarks of their respective companies.

CIRCLE 185 ON READER SERVICE CARD

■ Cross-Platform Utilities

Five Ways to Get on Speaking Terms with Mac Disks

BY J. W. OLSEN

Communicating with the Mac world is becoming a necessity. If you don't have a hardware solution (LAN, modem, direct cabling), software alternatives can now fill the gap. Some access Macintosh disks as emulators that run Mac software, with limitations, under DOS. Others—our focus here—transfer files between DOS and Mac 1.44MB floppy disks, and, often, alternate storage devices as well. (Older, lower-density Macintosh floppy disks require a DOS hardware assist.)

Transferring files is half the battle. The other half involves converting their format. The trend is toward compatible formats across the great Mac-PC divide, but format issues remain. Some Mac applications export files to formats that your applications recognize, and vice versa. Otherwise, consider conversion utilities like The Software ToolWorks' Word for Word/Professional or SCC's Software Bridge.

Unlike competitors, Conversions Plus 1.0 (First Looks, October 12, 1993) merges file-transfer and limited-format conversion capabilities under Microsoft Windows. Conversions Plus 2.0 ($149, DataViz; 800-733-0030, 203-268-0030; fax, 203-268-4345), unavailable in time for this review but shipping soon, supports two dozen new word processing, database, spreadsheet, and graphics formats.

MACACCESS 1.5

Hypro Technologies' $69 MacAccess is a 63K device driver that optionally loads into upper memory. Usage is virtually transparent. Your 3.5-inch high-density drive functions normally, but when addressed as a new virtual drive (like the D: drive), it accesses Mac disks with conventional DOS commands (COPY, DIR, and so on) except for formatting. A Mac formatting utility is provided. DOS and Microsoft Windows programs access Mac disks as if they were DOS disks, and Windows' File Manager automatically recognizes the virtual drive.

MacAccess is attractively priced and warrants consideration despite rough edges. It can conflict with disk caches, including SmartDrive, until you disable floppy disk caching. MacAccess can also be contentious with other device drivers, though you can usually overcome this by tweaking.

MacAccess has artificial disk access limitations. Only 50 files and 1.3MB can be processed at once. Otherwise, you must work with subsets of files (for example, *.TIF and *.DOC). But if a single file exceeds 1.3MB, you're out of luck. Hypro Technologies is addressing these limitations to make MacAccess more competitive.

• List price: *MacAccess, Version 1.5, $69.* Requires: *640K RAM, DOS 3.3 or later. Hypro Technologies Inc., 8557 Higuera St., Culver City, CA 90292; 310-473-0328; fax, 310-822-8123.*

Circle 404 on reader service card

MACDISK FOR THE PC 1.0

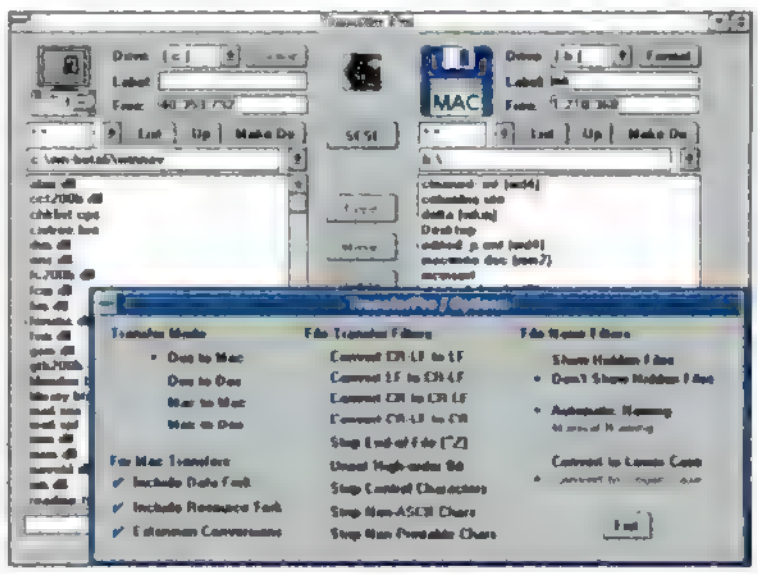
Like MacAccess, Insignia Solution's MacDisk for the PC also provides transparent access. The differences are less apparent than the similarities, but you may find they warrant MacDisk's higher $99.95 price.

MacDisk is a 57K stay-resident executable rather than a device driver; you can load it from AUTOEXEC.BAT, or later if needed. (If loaded into high memory, MacDisk requires only 0.2K of conventional RAM.) As with MacAccess, MacDisk provides a DOS utility to view the full characteristics of Mac files (the original 32-character filenames, and so on), but adds a comparable Microsoft Windows utility that also formats Mac disks.

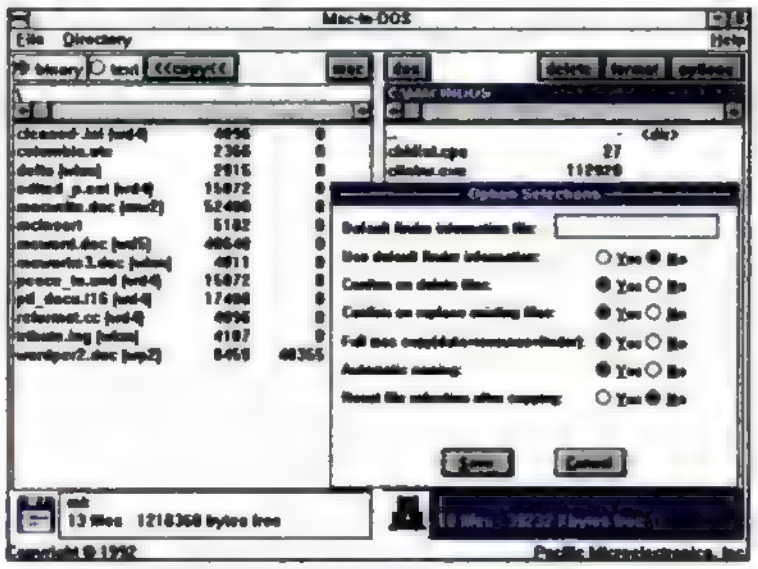
MacDisk doesn't assign a new drive letter. Instead, commands like "DIR B:" function with both Mac or DOS disks. And during informal testing, MacDisk manifested no contentiousness with other resident programs and device drivers. Lastly, MacDisk treats Mac folders like DOS subdirectories, while MacAccess treats all files on a disk as though they were in one directory. For directly accessing Mac disks as if they were DOS disks, MacDisk is top-notch.

• List price: *MacDisk for the PC, Version 1.0, $99.95.* Requires: *57K RAM, Windows 3.1. Insignia Solutions Inc., 1300 Charleston Rd., Mountain View, CA 94043; 800-848-7677, 415-694-7600; fax, 415-964-5434.*

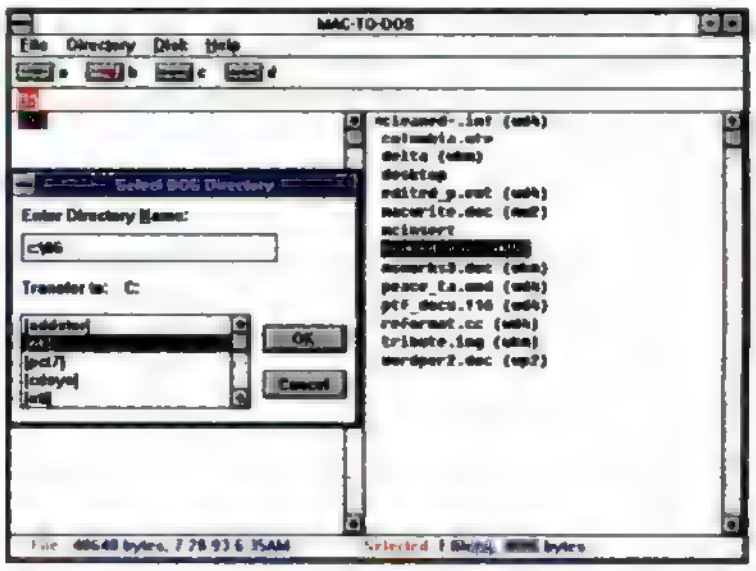
Circle 405 on reader service card



TRANSFERPRO: *The program gives you diverse file-conversion options.*



MAC-IN-DOS: *A straightforward interface helps you tackle translation tasks.*



MAC-TO-DOS: *The display shows only the contents of the source directory.*

MAC-IN-DOS WINDOWS 2.0

Pacific Microelectronics' $129 Mac-In-DOS Windows is a standalone program that transfers files to your hard disk for later access.

Usage is straightforward: Simply select, copy, and delete files. You can convert between barebones (ASCII) DOS and Mac text file formats, create and delete subdirectories, and format high-density Mac disks. But if a disk hasn't been previously formatted for DOS or Mac, you first must low-level-format it with Win-

dows File Manager or FORMAT.COM.

Informal tests reveal conflicts with PC-Kwik disk caching. And while built-in DOS and Windows memory managers lived harmoniously with Mac-In-DOS, expect to tweak third-party alternatives. Each time you invoke Mac-In-DOS, you must designate the drive letter for your 1.44MB drive, even with only one such drive present.

Like other Windows-specific products, Mac-In-DOS supports a limited number of magneto-optical and removable hard disks. But unlike alternatives, this requires a $189 enhanced edition. A DOS version offers comparable functionality for $99. Mac-In-DOS may be a bit more expensive, but it still shows promise.

• List price: *Mac-In-DOS Windows, Version 2.0, $129.* Requires: *640K RAM (512K RAM for DOS), DOS 3.3 or later, Windows 3.x. Pacific Microelectronics Inc., 201 San Antonio Circle, C250, Mountain View, CA 94040; 800-628-3475, 415-948-6200; fax, 415-948-6296.*

Circle 406 on reader service card

MAC-TO-DOS FOR WINDOWS 1.0

The Microsoft Windows interface of Peripheral Land's $99.95 Mac-to-DOS lets you select, copy, delete, move, and rename files. You can convert ASCII files from Mac to DOS format, but not vice versa. A modest file viewer displays files without regard to file format. Directories can be created, removed, and renamed.

Mac-to-DOS formats Mac disks but requires low-level formatting via File Manager or DOS. If disks are formatted on a Macintosh, the latter requires Apple's System 6.0.2 or later operating system.

Mac-to-DOS's user interface is simple—*too* simple: Mac-to-DOS displays the source directory without the destination directory to compare contents. Another shortcoming is that Mac-to-DOS didn't recognize an installed CD-ROM drive. Also, it is the only Windows-based product in this group that totally ignores important issues regarding Macintosh Finder and file resource forks—particularly if you exchange the same files back and forth with Mac users, who must reassign fonts and so forth for the lost resource forks and reassociate data files with parent Mac applications.

Like its DOS version, Mac-to-DOS for Windows supports some magneto-optical and removable hard drives. Expect good value for your money, though Version 1.0's weaknesses warrant close attention.

• List price: *Mac-to-DOS for Windows, Version 1.0, $99.95.* Requires: *4MB RAM, 1MB hard disk space, Windows 3.x. Peripheral Land Inc., 47421 Bayside Pkwy., Fremont, CA 94538; 800-288-8754, 510-657-2211; fax, 510-683-9713.*

Circle 407 on reader service card

TRANSFERPRO FOR WINDOWS 1.5

Despite very weak installation, Digital Instrumentation Technology's (DIT) $99 TransferPro for Windows 1.5 offers the most elegant user interface and feature-rich options in our roundup.

This Microsoft Windows product installs from a DOS batch file, but later, you must manually create a Program Manager program group item. Also, when invoked, TransferPro denies access until you contact the vendor for a password—an unfortunate holdover from DIT's Unix history.

Once running, TransferPro offers features beyond those of its competitors. Wildcard masks help focus upon desired files. TransferPro also provides diverse options to translate characteristics of transferred files, but, like the TransferPro file viewer, these options help primarily with unadorned ASCII files. More significantly, a feature displays extended data about Mac files, such as which application created them. You can alter attributes on DOS files, such as read-only and archive.

TransferPro handles Mac Finder and resource fork data well. It is also the only Windows-specific choice in our roundup capable of low-level disk formatting. Like its competitors, TransferPro accommodates a limited range of additional storage devices. All this makes TransferPro for Windows a solid contender for your Macintosh disk access needs.

• List price: *TransferPro for Windows, Version 1.5, $99.* Requires: *1MB RAM, Windows 3.x. Digital Instrumentation Technology Inc., 127 Eastgate Dr. #20500, Los Alamos, NM 87544; 800-467-1459, 505-662-1459; fax, 505-662-0897.*

Circle 408 on reader service card

Subnotebooks

New Northgate Is Too Heavy

BY TIN ALBANO

A year ago, Northgate's $2,599 ZXP-XL2/C would have been the hottest new notebook: 33-MHz 486SX power and a passive-matrix color screen in a 4.2-pound package. However, by today's subnotebook standards, the ZXP falls short of other better-built, lighter units.

The ZXP has a Sharp passive-matrix color screen (a monochrome version is available for $1,899). While the small size of the screen (7.75 inches) helps to increase its color contrast, it suffers from the same ailments associated with other passive-matrix color screens.

ON THE ROAD: *Though small, the ZXP's travel weight is 6.6 pounds.*

Northgate's decision to use a passive-matrix screen probably stems from a desire to cut production cost and unit weight. But while Northgate succeeded in its attempt to make the ZXP a few hundred dollars cheaper, the ZXP's bulky 6.6-pound package (including the unit, an external floppy, and the power adapter) make it too heavy to be considered a subnotebook.

The unit we tested came with a 170MB hard disk and 4MB of RAM (expandable to 20MB). The ZXP turned in a respectable score of 3.06 on our Graphics Winmark test (a score of 2.67 is the historical average of other 33-MHz 486-based notebooks). The ZXP also produced slightly above-average numbers on all of our benchmark tests except for DOS Video, where the unit fell well below average.

A compact 1.5 by 11 by 7 inches (HWD), the ZXP has a well designed, comfortable keyboard with 101 full-sized letter keys and dedicated function and cursor keys. The keyboard is set back, away from the front of the computer, making room for a palm rest. The trackball, however, is placed on the lower right side of the ZXP, making it difficult to manipulate.

Many of today's subnotebooks are equipped with active-matrix screens and weigh less than 6 pounds, making the ZXP-XL2/C seem a little behind the times. And although its $2,599 price tag is appealing, there are full-size passive-matrix color notebooks that weigh and cost about the same as the ZXP.

• List price: *Northgate ZXP-XL2/C $2,599. Northgate Computer Systems, P.O. Box 208, Chaska, MN 55318; 800-548-1993; fax, 612-943-6965.*

Circle 428 on reader service card

■ PIMs

$49 On-Schedule Has New Ways to Sort Out Your Life

BY BARRY SIMON

Odyssey Computing's $49 On-Schedule for Windows combines an intelligent interface design with some unique features, making it one of the most promising general-purpose PIMs that we've seen.

Like most PIMs, On-Schedule maintains four databases—address book, phone log, appointments, and alarms—plus a fifth that lets you track important on-disk files. On-Schedule lets you customize the views of your data. All five databases can be displayed as lists where you choose which columns appear and in what order. Sorting on a column is as easy as double-clicking on the column header.

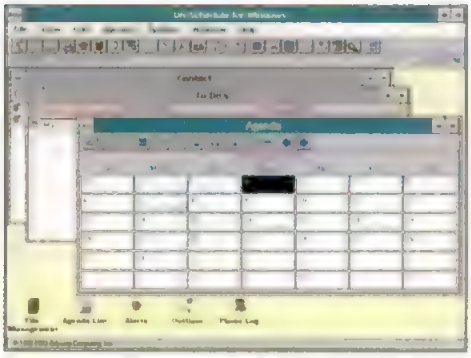
SEVERAL VIEWS

Separate daily, weekly, monthly, and yearly views of your calendar have their own button bars, allowing a quick change of view and a quick jump to appointments for yesterday, today, and tomorrow. You can open multiple views or open multiple databases together. That fact becomes important when you use On-Schedule's great drag-and-drop features.

For example, you can pick listings for several people in your address book and drag them to an appointment slot. The result is an appointment that lists their names.

When an appointment alarm goes off, you can hit a "snooze all" button that delays not only that particular alarm but also any other that is set to go off during the snooze period. If you have ExMachina's Notify for Windows, you can set an alarm to dial a Skytel or MobilCom pager and send the alarm message to it.

The most obvious problem with the program is in its phone log. When the phone log is active, you can't access the rest of On-Schedule; so, for example, you can't give someone else a phone number or set up an appointment without closing the log entry.



PIM CONTROL: *On-Schedule's windows have their own toolbars.*

You can do a fax merge or single fax send from On-Schedule to Eclipse FAX, WinFax PRO, or FaxWorks. The faxes can be written in On-Schedule's own word processing module or in Microsoft Word for Windows or WordPerfect.

On-Schedule is a pleasure to use, although it won't be good for those with extensive contact management needs. It's such a good first version with such ambitious plans that anyone in the market for a new PIM should keep their eye on it.

• List price: *On-Schedule for Windows, Version 1.0a, $49.* Requires: *2MB RAM (4MB recommended), 3MB hard disk space, Microsoft Windows 3.1. Odyssey Computing Inc., 5962 La Place Court, #215, Carlsbad, CA 92008; 619-929-7828; fax, 619-929-1012.*

Circle 433 on reader service card

■ Screen Capture

Steal Images with Screen Thief

BY J.W. OLSEN

If all DOS software were well behaved, you'd be satisfied with almost any utility designed to capture screen images. But in the real world, some DOS products—particularly games and business applications that involve animation—defy most capture utilities since they take control of interrupts and don't pass that control back to programs loaded earlier.

Screen Thief, Version 1.50, is an effective $39 solution to this dilemma. Among other bits of programming magic, Screen Thief remaps interrupt hardware to new vectors, which are then given to subsequently loaded software. By doing so, Screen Thief's hotkey always works, even when software otherwise locks out keyboard input.

Though it uses only about 9K of conventional memory (about 2K if loaded into upper memory), Screen Thief has several additional virtues. You can save graphics screens to a variety of file formats (.BMP, .GIF, .PCX, and TIFF), and you can save text screens to three formats, including a character-and-attribute screen dump useful primarily to programmers. Output can be forced to monochrome, and the compression capabilities inherent in .BMP and TIFF formats are user-controllable.

Though VGA video hardware is required, Screen Thief supports CGA, EGA, Hercules, and MDA emulation modes. And unlike many competitors, Screen Thief can unload itself from memory.

Screen Thief functions within Windows either by being loaded before Windows or within a DOS box after Windows is invoked. Screen Thief won't entirely replace a Windows-specific capture utility, and some additional Windows-related restrictions apply. But our testing indicates Screen Thief reliably captures DOS programs within Windows.

Software that fools capture utilities can often become unstable without total control of interrupts, so system instability and lockups are possible. In substantial testing, however, Screen Thief caused no difficulties that a reboot wouldn't fix.

Screen Thief provides a variety of powerful, user-settable options. In some ways, it offers more than casual users may want, but if your job depends upon the ability to capture images of even the most demanding DOS software, Screen Thief is a great tool.

VERSATILITY: *Screen Thief offers more options than most competitors.*

• List price: *Screen Thief, Version 1.50, $39.* Requires: *256K RAM, DOS 3.1 or later. Public Software Library, P.O. Box 35705, Houston, TX 77235; 800-242-4775, 713-524-6394; fax, 713-524-6398.*

Circle 428 on reader service card

THE EASIEST-TO-USE WINDOWS SPREADSHEET

"Quattro Pro—that's like being offered a Lexus for the price of a Hyundai."

—*Los Angeles Times*, September 23, 1993

Experts say Quattro Pro is better than 1-2-3 and Excel

New Quattro® Pro 5.0 for only $49.95? Isn't this the spreadsheet that just outscored 1-2-3 in performance, ease of learning and use, and quality of output and presentations, in *PC Week's* critical "First Look" review? Isn't this the spreadsheet that just revolutionized ease of use with the introduction of Spreadsheet Notebooks, Interactive Tutors, and productivity Experts™? Isn't this the spreadsheet that *PC Computing* voted Most Valuable Product over Lotus 1-2-3 and Excel 5.0?

Yes. Yes! YES!

"This program is *hot*!"
—*InfoWorld*, Nov. 1993

Well, why on earth is Borland virtually *giving* it away? The answer is simple. We want to make you an offer so irresistible, you'll rush out to see today's hottest spreadsheet.

Breakthrough technology you have to see to believe

InfoWorld says, "several innovations give Quattro Pro a leg up on the current version of Excel." Interactive Tutors teach new users how to perform common tasks. Experts walk you through advanced analytical procedures, chart creation, scenario management, and worksheet consolidation. There are new @functions, new Intelligent Graphs, new ways to analyze your data graphically, and easier ways to manage scenarios. The Database Desktop™ unlocks the doors to external databases, and the Data Modeling desktop outperforms Lotus Improv. Plus the new Workgroup Edition builds in full support for SQL servers and lets you share worksheets with others over networks and E-mail.*

Now is the perfect time to take the world's best spreadsheet for a spin. Test-drive Quattro Pro today. Available in award-winning DOS, Windows, and special Workgroup editions.

Award-winning selection!

DOS | Windows | Workgroup Edition Upgrade

90-day, money-back guarantee!

See your dealer or call now, 1-800-336-6464, ext. 7901

In Canada call, 1-800-461-3327.

Borland

Power made easy™

*Supported communication transports: Novell Message Handling Service (MHS and NGM); MCI Mail; cc:Mail (vendor-independent messaging); Windows for Workgroups, MS-Mail, and other MAPI-compliant messaging services; Local Area Network (LAN) systems, such as Novell NetWare, Banyan, IBM® LAN Server, MS-LAN Manager, AT&T StarGROUP, and other peer-to-peer networks. Offers good in the United States and Canada only. All prices in U.S. dollars. Dealer prices may vary. Copyright © 1993 Borland International, Inc. All rights reserved. All Borland product names are trademarks of Borland International, Inc. Quattro Pro for Windows and Spreadsheet Notebooks have patents pending. BI 6294

CIRCLE 220 ON READER SERVICE CARD

Word Processing

XyWrite for Windows: Command Line Holdout In a GUI World

BY EDWARD MENDELSON

XyWrite for Windows brings the speed and efficiency of the XyWrite command line to the graphic environment of Windows. The Windows version of The Technology Group's $495 word processor uses exactly the same files and embedded codes as XyWrite for DOS.

Although it comes with drop-down menus, toolbars, and other graphic conveniences, it's the only Windows word processor that lets you control formatting, file management, and printing from a command line and directly edit formatting codes in your files. XyWrite veterans can at last use the advanced features of Windows without giving up XyWrite's fast text entry, macros, and customization.

The Windows version uses substantially the same menu structure as XyWrite IV for DOS. It lets you switch between draft and graphic views and has an expanded view that lets you edit formatting codes.

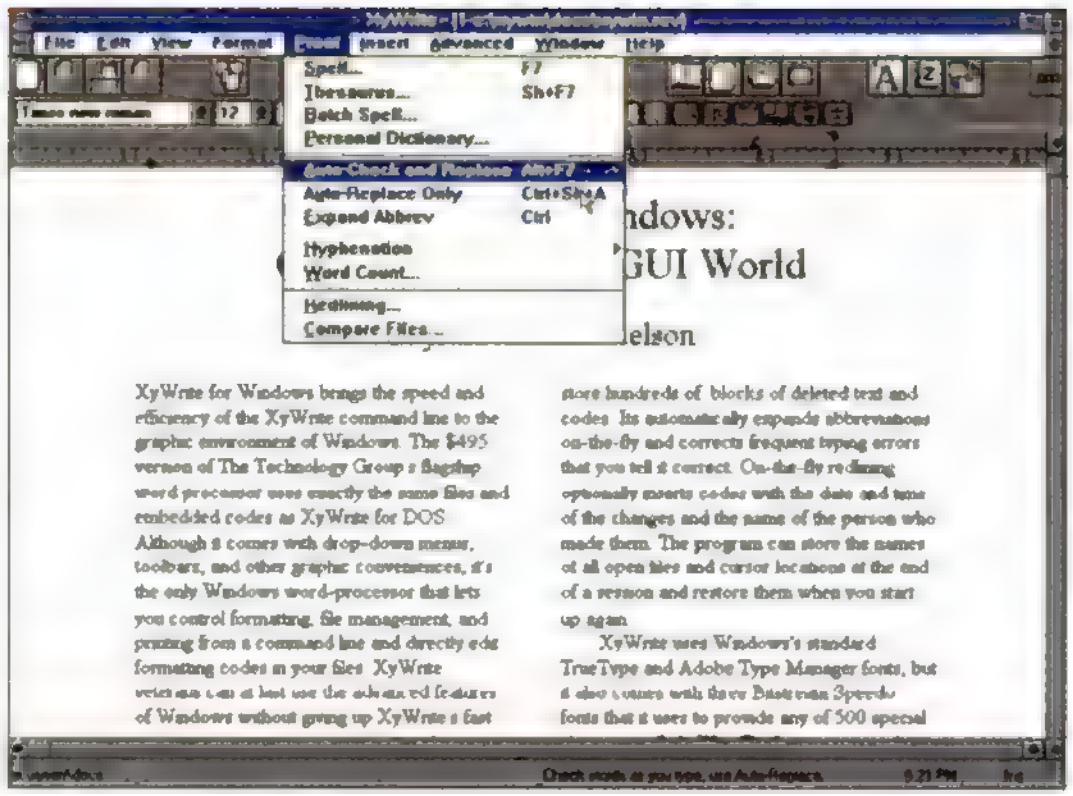
The optional toolbar and ribbon look less polished than those in rival Windows word processors, but they include most of the options that you'd want to access with a mouse. As in the DOS version, you can customize the program via menus or by directly editing an ASCII file that lists the defaults.

XyWrite doesn't have a Windows-standard Undo function, but you can tell it to store hundreds of blocks of deleted text and codes. It automatically expands abbreviations on the fly and corrects frequent typing errors that you tell it to correct. You can also use on-the-fly redlining, which inserts codes with the date and time of the changes and the name of the person who made them.

XyWrite uses the standard Windows TrueType and Adobe Type Manager fonts, but it also comes with three Bitstream Speedo fonts, which it uses to provide any of 500 special characters. Only WordPerfect supports a larger character set.

Don't look to XyWrite for advanced graphics functions, although you can import standard graphic formats through a clumsy process that opens a separate window for the image before it inserts it in the file. And don't look for OLE support or smart imports from other word processing formats. If you don't specify which program created the file you import, all the file's formatting codes display on screen as garbage characters.

XyWrite for Windows isn't as smooth as other Windows word processors, but XyWrite veterans prefer a command line and raw editing power to the graphic frills found elsewhere.



AUTO-CORRECT: *XyWrite automatically corrects typing errors.*

• List price: *XyWrite for Windows, Version 4.1, $495; upgrade, $129.* Requires: *2MB RAM, 2MB hard disk space, Windows 3.x. The Technology Group, 36 South Charles St., #2200, Baltimore MD 21201; 410-576-2040; fax 410-576-1968.*

Circle 424 on reader service card.

Video

STB's Pegasus PCI: Rich Colors for the Big Picture

BY BEN MYERS

The $999 Pegasus PCI from STB Systems is one of the first graphics boards designed especially for the Personal Computer Interconnect (PCI) bus. By taking advantage of an S3 928PCI graphics chip and 4MB of video random access memory (VRAM), the board delivers a broad spectrum of resolutions and color depth with eye-popping performance, especially for 24-bit true color.

The Pegasus PCI has only a single jumper to enable or disable the graphics hardware IRQ used by some software, and a standard 15-pin connector for a monitor. STB provides its own setup program for the initial installation of the drivers. Afterward, you use STB's WINSTALL program to change resolutions or number of colors.

COLOR-RICH

With its abundant VRAM, the Pegasus PCI allows true color (16 million colors) at up to 1,024-by-768 resolution, high color (up to 65,000 colors) at up to 1,280-by-1,024, or 256 colors at up to 1,600-by-1,280. In true-color modes, the board uses 24 bits out of 32.

VRAM SLAM: *The Pegasus PCI has 4MB of VRAM on-board.*

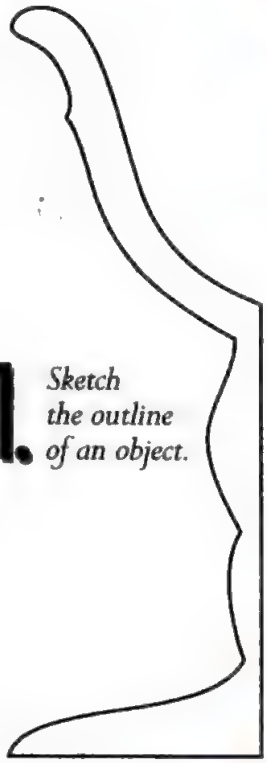
We tested the Pegasus PCI on an American Megatrends PCI motherboard built around a 33-MHz 486 processor. The graphics card takes advantage of the PCI bus and its VRAM to perform very quickly at all color depths. Its Windows drivers use off-screen memory to cache the Windows system font and various frequently used bitmapped objects. As a result, its impressive Graphics WinMark test results dropped off slowly as the number of colors increased, while its results on the WinBench Image Blit test were halved with progressively greater color depth.

Compared with the cost of other graphics boards, $999 may seem a high price to pay, but the Pegasus PCI yields first-rate graphics performance for the price. Consider it if you use a large monitor (19 inches or larger), use high resolutions, or work extensively with true-color images.

• List price: *Pegasus PCI, $999. STB Systems Inc., 1651 N. Glenville Rd., Richardson, TX 75081; 800-234-4334, 214-234-8750; fax, 214-234-1306.*

Circle 429 on reader service card

NOW DAZZLING 3-D IS AS EASY AS...



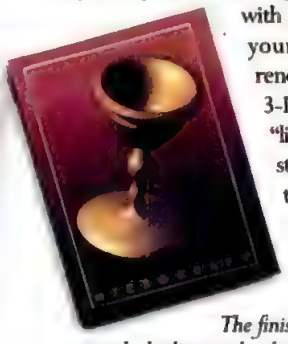
1. *Sketch the outline of an object.*

2. *Click and "sweep" it into three dimensions.*

3. *Click again to rotate the object as desired.*

NEW "INSTANT 3-D" JOINS DESIGNER'S LEGENDARY ARRAY OF PROFESSIONAL DRAWING TOOLS!

Professional illustration made easy. That's what has made Micrografx Designer™ the choice of artists, designers and illustrators worldwide. And now, we've made it even *easier* for you to produce dazzling drawings. Because with just a few clicks of your mouse, you can render objects in true 3-D – then rotate and "light" them to achieve striking results in no time at all!



The finished illustration, with smooth shading at the click of a mouse!

"The new version of Designer is a tour de force, encompassing advanced 3-D conceptual modeling, sophisticated text handling, precision illustration and symbol management, full client/server OLE support and exceptional color handling."

Windows Sources
December, 1993

An all-new interface makes Designer incredibly easy to use. But it's packed with enough features to satisfy the most demanding professional. Including photo retouching, color matching, color separation and much, much more.

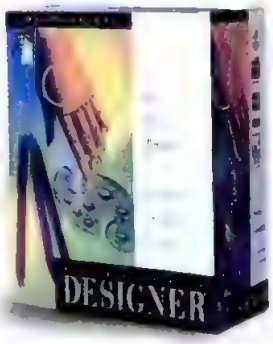
Find out why Designer is becoming the standard for precision illustration. *See your dealer or call today!*

Upgrade to Designer 4.0 now and save big!
If you're using another PC illustration product, act fast and upgrade to Designer 4.0 for only **$199**. Current Designer users, only **$149**. *Call today!*

M I C R O G R A F X®

DESIGNER 4.0

The Professional's Choice for Graphics Illustration



1-800-877-8668

M I C R O G R A F X®

Micrografx, Inc., [illegible] Richardson, TX [illegible] 75083-1769. Micrografx has offices in Toronto, Paris, London, Milan, Sydney, Madrid and Tokyo. Copyright © 1994, Micrografx, Inc. All rights reserved. Micrografx is a registered trademark and Designer is a trademark of Micrografx, Inc. All other products are trademarks or registered trademarks of their respective owners.

CIRCLE 361 ON READER SERVICE CARD

CD-ROM

$79 Random House Dictionary: Look It Up Under Bargain

BY RUBIN RABINOVITZ

Until recently, shopping for a good on-line dictionary has been frustrating. The 615,000-entry Second Edition of the Oxford English Dictionary on CD-ROM is an impressive tool, but it sells for a sticker-shock price of $895.

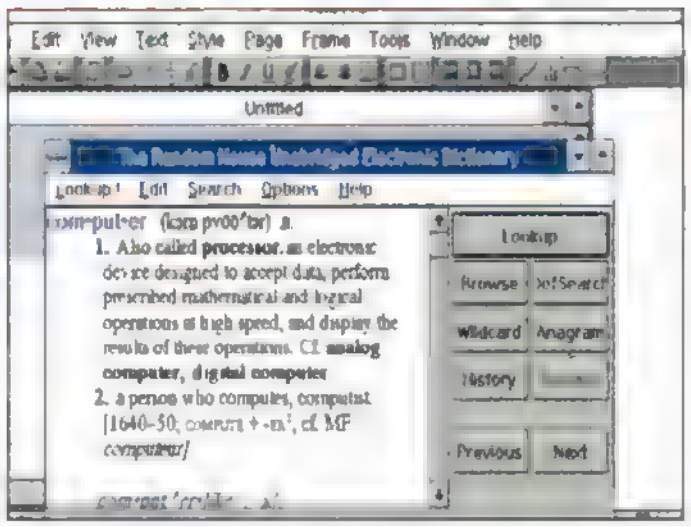
The new Random House Unabridged Dictionary, Second Edition, on CD-ROM, bridges this gap. Its price is competitive: $79 for the CD-ROM, $100 for the print version, and $159 for both. The CD-ROM's A-to-Z entries are the same as the 1993 print version's, with 315,000 entries. If it includes relatively few of the obsolete words you'll find in OED2, Random House's lexicon is still more than enough for most users' needs.

The first unabridged dictionary of American English published since 1987, Random House has many technical and recently coined terms like *jaggies, palmtop, pen-based, trackball, neural network phone tag, wannabe, slippery slope, brew-pub*, and *spin doctor*. Biographical and geographical listings include up-to-date entries such as *Hillary Rodham Clinton, David Souter*, and *Gulf War*.

Random House gives a word's syllable breaks, pronunciation, etymology, and date of entry into the language; for some entries, there are also synonyms and sentences illustrating usage. The program offers many options for retrieving data: You can browse through the headwords in alphabetical order, automatically look up terms in the definitions text, or type in words. You can use wildcards when retrieving words, and if you misspell a word the program will list properly spelled alternatives.

Boolean searches let you look for combinations of words in the definitions text; for example, the string "blue AND flower OR flowers" will give you a list with cornflower, ageratum, and other blue flowers.

The disk is easy to use and has a well-designed interface. The same disk works on Windows, DOS, or Mac systems.



RANDOM POP-UP: *Random House can easily pop up over other programs.*

Random House Unabridged is the mother of all American-English on-line dictionaries, a high-concept reference tool ideal for stressed-out linguistic semiamateurs whose low-rent lifestyles make OED2 seem like a deep-pockets megadeal. What's more, unlike the OED, Random House can supply definitions for all the adjectives in this paragraph.

- List Price: *Random House Unabridged Dictionary, Second Edition, $79; with book, $159.* Requires: *2MB RAM, 1MB hard disk space, DOS 3.0 or later. Random House Reference and Electronic Publishing, 201 E. 50th St., New York, NY 10022; 800-733-3000, 212-751-2600.*

Circle 431 on reader service card

American Heritage Third Edition Goes Digital

If you're looking for a lower-priced alternative to the Random House CD-ROM, Softkey Software International's $39.95 American Heritage Dictionary, Third Edition, is for you. It offers easy retrieval of words, an attractive interface, biographical and geographical listings, extensive search features, a thesaurus, and a Windows uninstall routine. American Heritage comes on a CD-ROM disk with versions for DOS, Windows, and Macintosh (there's also a floppy disk–based package available if you want to run the 15MB program from your hard disk). The dictionary includes the complete text of the 1991 printed *American Heritage College Dictionary*. Weighing in at 200,000 words, it's about two-thirds the size of Random House's CD-ROM offering. —*RR*

Uninterruptible Power Supplies

Exide's New UPS: Network And Energy Management

BY STEVE BUEHLER

Exide Electronics Group has added power-management features to the Exide Powerware Prestige Model 1000 EXT, the newest addition to its line of uninterruptible power supplies. The small and efficient, $1,199 unit, rated at 1,000 volt-amps, supports standalone workstations or up to three small file servers.

The EXT has built-in communications support, optional SNMP network management support, easy scalability to extend battery time, and, through the proprietary OnliNet software, the ability to schedule graceful shutdowns and restarts of protected equipment.

The EXT is an effective insurance policy against power outages or fluctuations. While most UPSs available today provide this protection, the EXT focuses on providing clean, consistent power to your equipment during severe power fluctuations and outages. High- and low-voltage ranges (135V AC to 85V AC) are handled with the EXT spending less time than many competing UPSs on battery power.

Exide's OnliNet power-management software, available for NetWare, Sun/OS, HP/UX, AIX, NCR's SVR4, SGI's IRIX, Windows NT, and OS/2, lets you manage all the EXTs on your LAN. Any workstation running this software can monitor the status, loads, historical uptime, and UPS-relevant events that have occurred to the EXTs.

The EXT is solidly constructed; installation and setup were simple and direct. As with most UPSs, the EXT takes additional battery modules. Up to four modules, available in five-cell ($379) and ten-cell ($489) increments, can be added to provide the level of full power backup you need.

With lower overall operating costs than comparable UPSs, the EXT is especially appropriate for small offices and environments where power consumption costs can really be managed.

- List price: *Exide Powerware Prestige Model 1000 EXT, $1,199. Exide Electronics Group, 8521 Six Forks Rd., Raleigh, NC 27615; 800-554-3448, 919-872-3020; fax, 919-870-3450.*

Circle 432 on reader service card

AVOID DELAYS GETTING TO WORK.

Don't waste precious time. Use Sony QD2120 formatted QIC-80 data cartridges. The perfect shortcut for your QIC-80 drive.* Saving you up to two hours of formatting time for more productive pursuits. Like backing up your critical data. To keep your PC system running on schedule, take the quick route. For more data, just call 201-476-8199.

ONLY ON SONY DATA MEDIA

SONY.

CIRCLE 377 ON READER SERVICE CARD

© 1993 Sony Electronics Inc. Reproduction in whole or in part without written permission is prohibited. All rights reserved. Sony and Only On Sony are trademarks of Sony. *QIC-80 drives from Colorado Memory Systems, Conner Peripherals, Iomega, Summit Memory Systems and Wangtek

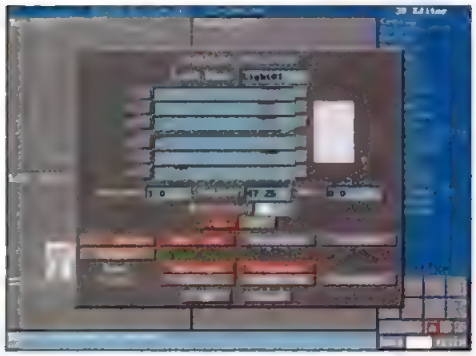
■ 3-D Rendering and Animation

3D Studio Sets the Standard—Again

BY LUISA SIMONE

With production-oriented turbocharging and literally hundreds of enhancements, Autodesk 3D Studio, Release 3.0 ($2,995), has something more than the power to add motion to static objects. It has the momentum to become the solid-modeling and animation standard for the PC.

The 2D Shaper module now features Boolean and Bezier-curve functions, so you can easily modify outlines by adding and subtracting shapes from one another, or you can create your shapes using an external drawing program and then import the curves via 3D Studio's new Adobe Illustrator import filter. Changes that at first glance seem small, such as the Keyframer's ability to apply motion blurs on an object-by-object basis or to morph both the surface texture and geometry of an object, can ultimately have a big impact on the quality of your animations.



BRIGHT LIGHTS: *3D Studio allows you to configure lights in a number of ways.*

GETTING REAL

Without a doubt, the most visually dramatic improvements can be found in the 3D Editor and Materials Editor, where lighting controls and texture maps combine to create photo-realistic surfaces and special effects. Simulating dappled sunlight, for example, is now as simple as projecting a bitmapped picture—or even an animation—from a light source. And a much-improved Materials Editor can generate accurate metallic surfaces, automatic reflections, and layered texture maps.

It's no surprise to learn that these special effects are computationally intensive. 3D Studio provides several tools that help you to work not just faster but smarter. The new Render Region command, for instance, lets you specify a small representational portion of a scene for quick previews. Even more important is the way in which 3D Studio can take advantage of a networked environment to distribute the grunt work—also known as rendering—among multiple computers. Though the main program still relies on an antiquated hardware copy-protection scheme, you can now install up to 9,999 copies of the program on slave workstations and then assign specific frame ranges to each computer for final output.

Though many of the features in 3D Studio have become more accessible, this is still a product for professional moviemakers. Features such as the new Video Post dialog box clearly target high-end users familiar with the compositing techniques of key colors and alpha-channel transparencies. Likewise, IPAS routines (which stands for image processing, procedural modeling, animated stand-ins, and solid patterns) can significantly extend the functionalities of 3D Studio, but only if you are a third-party developer or feel comfortable programming in C. For example, the solid-pattern external process can generate, unlike a texture map, a surface pattern that is resolution independent.

The original release of 3D Studio set a new standard for high performance and relatively low-cost animation on the PC. Release 3.0 raises the standard by which all professional-level animation programs must now be measured.

• List price: *Autodesk 3D Studio, Release 3.0, $2,995; upgrade, $497.* Requires: *8MB RAM, 20MB hard disk space, DOS 3.3 or later. Autodesk Inc., 2320 Marinship Way, Sausalito, CA 94965; 800-879-4233, 415-332-2344.*

Circle 425 on reader service card

■ Modems

Microcom V.Fast Modem: Parallel Paths to Speed

BY EARLE ROBINSON

At a price of $499, Microcom's new DeskPorte FAST modem undercuts competitors' V.Fast modem prices, some of which are over $1,200. The Microcom modem, based on the Rockwell V.FC chip set, offers speeds of up to 28.8 Kilobits per second. Class 1 Fax capabilities are at 9,600 bps (V.29) and 14.4 Kbps (V.17).

The modem's ability to use a parallel port when running a Windows program for either faxing or data is unique. This overcomes the dreaded timing problems and data overruns encountered when running serial communications. By using the parallel port, the modem can transfer data 8 bits at a time, and 2K buffers avoid the limitations of the serial interrupt. The serial port can be used, too, but for maximum throughput, most systems will be hard pressed to keep up. Further, most system serial ports lack the 16550 UART, and, therefore, its expanded buffering.

V.FAST: *The DeskPorte moves data at up to 28.8 Kbps.*

Our testing confirmed the ability of the parallel port to handle maximum throughputs (when telephone lines were adequate). As expected, when we used the serial port, system performance suffered at speeds over 19.2 Kbps, even with a 16550 UART on the serial card. Use of a smart serial card, however, provided performance to equal the parallel-port tests.

The parallel-port connection is especially convenient for notebook users, since the built-in serial port may be tied up for network access. An A/B switch box may be used to permit attaching a printer to the same parallel port, though you must exit the communications program before switching back to the printer.

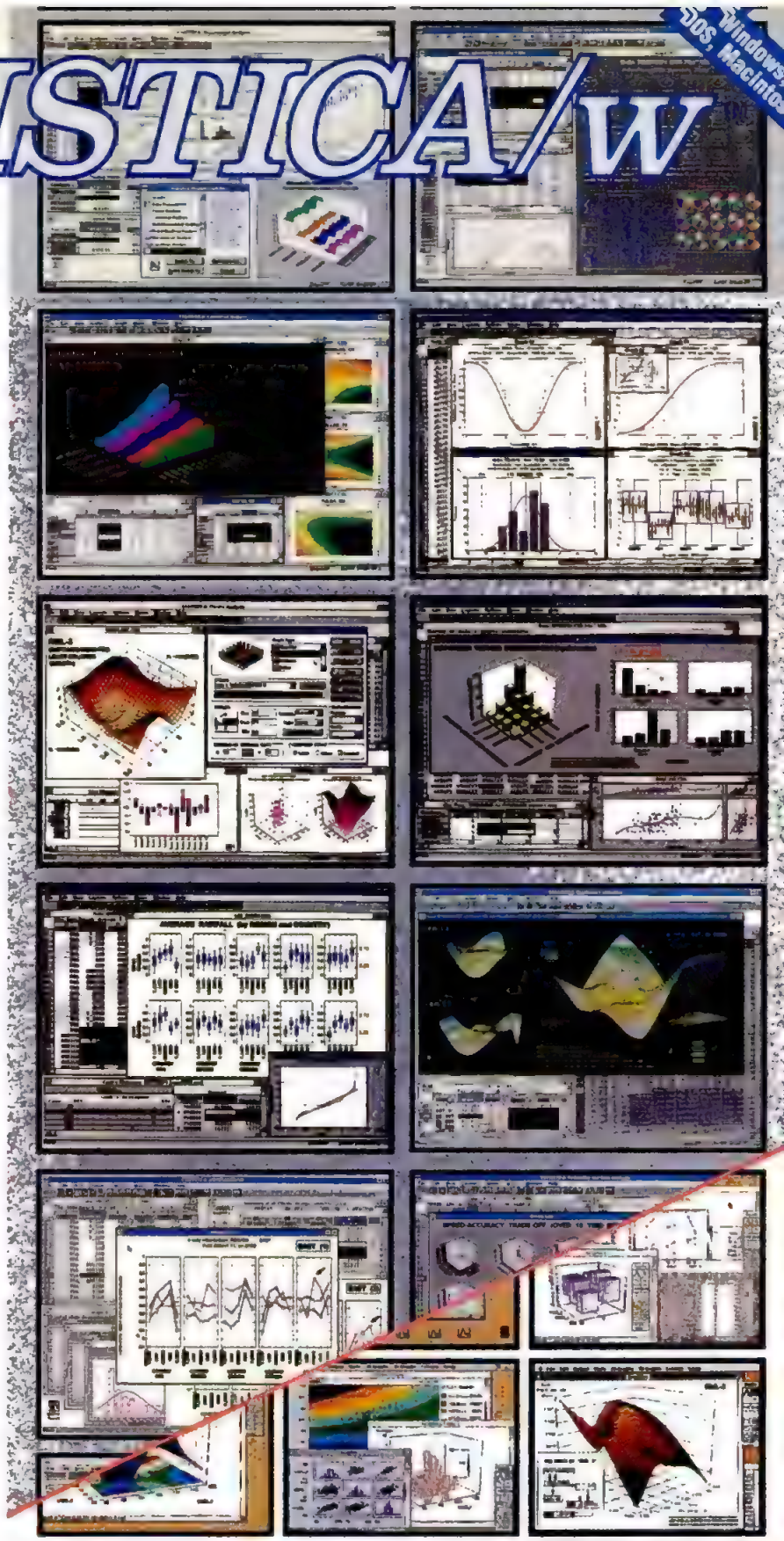
Included with the modem is a stripped-down version of Sofnet's FaxWorks Pro 3.0. Given the lack of features such as cover sheet preparation and a Twain driver, it's little more than a demo program. Equally unfortunate is that although the manual is thorough and complete, it is poorly organized, and installation of the parallel-port access is complex in spite of an addendum sheet.

• List price: *Microcom DeskPorte FAST, $499. Microcom Inc., 500 River Ridge Dr., Norwood, MA 02062; 800-822-8224, 617-551-1000; fax, 617-551-1021.*

Circle 426 on reader service card

STATISTICA/w

Windows, DOS, Macintosh



STATISTICA/w™ (for Windows) Complete Statistical System with thousands of on-screen customizable, presentation-quality graphs fully integrated with all procedures ■ Complete Windows 3.1 support, DDE, OLE, TT-fonts, multiple toolbars, right mouse button support ■ Unlimited numbers of data-, results-, and graph-windows ■ Inter-window integration: data, results, and graphs can be treated as objects and converted into one another in a number of ways ■ The largest selection of statistics and graphs in a single system; comprehensive implementations of: Exploratory techniques; multiway tables with banners (presentation-quality reports); nonparametrics; distribution fitting; multiple regression; general nonlinear estimation; stepwise logit/probit; general ANCOVA/MANCOVA; stepwise discriminant analysis; log-linear analysis; factor analysis; cluster analysis; multidimensional scaling; canonical correlation; item analysis/reliability; survival analysis; time series modeling; forecasting; lags analysis; quality control; process analysis; experimental design (with Taguchi); and much more ■ Manuals with comprehensive introductions to each procedure and examples ■ Hypertext-based Stats Advisor expert system ■ Extensive data management facilities (spreadsheet with long formulas, block operations, advanced Clipboard support, DDE hot links, relational merge, data verification, powerful programming language) ■ Batch command language and macros also supported, "turn-key system" options ■ All output displayed in Scrollsheets™ (dynamic, customizable, presentation-quality tables with toolbars, pop-up windows, and instant 2D, 3D and multiple graphs) ■ Extremely large analysis designs (e.g., correlation matrices up to 32,000x32,000, unlimited ANOVA designs) ■ Megafile Manager with up to 32,000 variables (8 Mb) per record ■ Unlimited size of files; extended ("quadruple") precision; unmatched speed ■ Exchanges data and graphs with other applications via DDE or an extensive selection of file import/export facilities ■ Hundreds of types of graphs, including categorized multiple 2D and 3D graphs, matrix plots, icons, and unique multivariate (e.g., 4D) graphs ■ Facilities to custom design new graphs and add them permanently to menu ■ On-screen graph customization with advanced drawing tools, interactive stretching and resizing of complex objects, interactive embedding of graphs and artwork, special effects, icons, maps, multi-graphics management, page layout control for slides and printouts; unmatched speed of graph redraw ■ Interactive rotation, perspective and cross-sections of all 3D and 4D graphs ■ Extensive selection of tools for graphical exploration of data: fitting, smoothing, overlaying, spectral planes, projections, layered compressions, marked subsets ■ Price **$995**.

Quick STATISTICA/w™ (for Windows) A comprehensive selection of basic statistics and the full graphics capabilities of STATISTICA/w ■ Price **$495**.

STATISTICA/DOS™ (for DOS) A STATISTICA/w-compatible data analysis system ■ Price **$795**.

Quick STATISTICA/DOS™ (for DOS) A subset of STATISTICA/DOS statistics and graphics ■ Price **$295**.

Domestic sh/h $10 per product; 14-day money back guarantee.

CIRCLE 057 ON READER SERVICE CARD

StatSoft™

2325 E. 13th St. • Tulsa, OK 74104 • (918) 583-4149
Fax: (918) 583-4376

Overseas Offices: Statsoft of Europe (Hamburg, FRG), ph: 040/ 4200347, fax: 040/4911310; **StatSoft UK** (London, UK), ph: 0462/482822, fax: 0462/482855; **StatSoft Pacific** (Melbourne, Australia), ph: (03) 663 6580, fax: (03) 663 6117; **StatSoft Canada-CCO** (Ontario), ph: 416-849-0737, fax: 416-849-0918. Available From: CORPORATE SOFTWARE and other Authorized Representatives Worldwide: Holland: MAB Julsing, 071-230410; France: Version US (1) 40590913; Sweden: AkademiData 018-240035; Hungary: Dagent Kft 186-5782; Belgium: TEXMA 10 61 16 28; South Africa: Osiris 12 663-4500; Japan (Macintosh): Three's Company, Inc., 03-3770-7600; Japan (DOS and Windows): Design Technologies, Inc., 03-3867-1110.

STATISTICA/Mac™ (for Macintosh) A STATISTICA/w-compatible, comprehensive data analysis and graphics system designed for the Macintosh ■ Large selection of statistical methods fully integrated with presentation-quality graphics (incl. EDA, multiplots, a wide selection of interactively rotatable 3D graphs; MacDraw-style tools) ■ Unlimited size of files ■ Full support for System 7, incl. "Publish and Subscribe" ■ Price **$695**.

Quick STATISTICA/Mac™ (for Macintosh) A subset of STATISTICA/Mac: a comprehensive selection of basic statistics and the full graphics capabilities of STATISTICA/Mac ■ Price **$395**.

The best reasons in the world to choose Primavera software.

Melbourne Cricket Ground, Australia
The new 47,000 seat Great Southern Stand replaces the smaller original built in 1937 Finest Hour® helped schedule and coordinate the project's extensive concrete work.

U.S. Embassy, Bolivia
Primavera software is being used to control the construction of the new $30 million U.S. Embassy in La Paz.

Remote Sensing Satellite, Canada
RADARSAT is a low orbit satellite that will take radar images of the earth. The engineering, design and manufacturing stages for this $300 million project are being scheduled using Primavera Project Planner® (P3®)

The Autobahn, Germany
P3 will be used to rebuild the Autobahn in what was formerly East Germany. Both contractors and subcontractors are standardizing on Primavera for this project

New Hong Kong Airport, Hong Kong
This $20 billion airport construction project also includes the construction of highways, an airport rail system, a suspension bridge and a cable stay bridge. Projected completion is June 1997

Kuala Lumpur Tower, Malaysia
This $100 million, 420-meter tower will be the third tallest communication tower in the world. Estimated completion date is 1996

The Georgia Dome, USA
The new $210 million structure features the world's largest cable-supported dome. P3 and Expedition® were used for scheduling and control

Think about project management, and one name comes to mind. Primavera.

It's the software that people who run projects have come to rely on.

Call 1-800-423-0245 for a Free Preview Disk that shows what Primavera Project Planner can do for your projects. Or ask for a personal demonstration of Primavera capabilities in scheduling, resource management, cost control, performance measurement, contract control, communication and risk analysis.

We've got all the software you need to put your project on the map.

PRIMAVERA

How the world says project management

Two Bala Plaza • Bala Cynwyd, PA 19004 • USA
(215) 667-8600 • FAX: (215) 667-7894

International Business Park • Europe Building
F-74166 Archamps • France • 33-50 31.57 80
FAX 33-50 31 57 85

CIRCLE 148 ON READER SERVICE CARD

New & Improved

NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

By Anush Yegyazarian

NEW

Keeping Home and Office In Sync—Wirelessly

A joint effort by **National Semiconductor Corp.** and **Traveling Software** has produced LapLink Wireless with AirShare, a combination hardware and software product that facilitates file updates between multiple PCs. The product consists of two radio modules that attach, for example, to your office PC and your portable; Synchro Plus software automatically synchronizes updated files or directories whenever a connection is detected.

The 3-ounce radio modules can connect computers within a radius of 30 feet. You can select the radio frequency to ensure a clean channel. LapLink Remote Access Software is included.

• List price: *LapLink Wireless with AirShare, $299.95. National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, CA 95052; 800-272-9959, 408-721-5000; fax, 408-721-4115. Traveling Software Inc., 18702 North Creek Pkwy., Bothell, WA 98011; 800-343-8080, 206-483-8088; fax, 206-487-1284.*

Circle 412 on reader service card

NEW

A Few Good Men (from Logitech): SoundMan and ScanMan

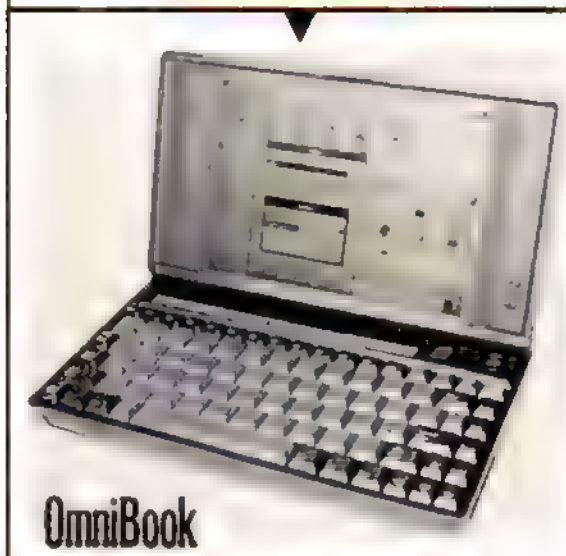
The latest SoundMan from **Logitech** is SoundMan Wave, an AT-bus card that supports synthesized music, provides digital recording and playback, and has both FM and Wave table synthesizers. It handles 8- and 16-bit stereo and mono files, has a CD-ROM interface, and bundles several software packages.

Logitech also presents its ScanMan PowerPage, a small 256-gray-scale scanner that can be used as a sheet-fed full-page scanner or as a hand-held unit. It has 100- to 400-dpi resolution, is Twain and OLE compatible, and connects to any parallel port. It includes Logitech's Foto-Touch Color, Caere's OmniPage Direct, Any-Font OCR for Logitech, and faxing software.

• List price: *SoundMan Wave, $349; ScanMan PowerPage, $799. Logitech Inc., 6505 Kaiser Dr., Fremont, CA 94555; 800-231-7717, 510-795-8500; fax, 510-792-8901.*

Circle 413 on reader service card

HOT PROSPECT



OmniBook Makes the Leap to 486

Hewlett-Packard Co. has decided to upgrade its super-light subnotebook from an AMD 386 to the TI 486SLC/25e processor, adding power and energy-saving features in one fell swoop.

The 2.9-pound OmniBook 300 subnotebook made a splash earlier this year with its low weight, long-lasting battery life, and innovative pop-out mouse. Its biggest drawback was the 386 CPU, replaced in the new 425 model. HP has also upped the available DOS memory to 560K from the 450K limit in the original OmniBook, which isn't quite as good as standard DOS (640K) but does eliminate most insufficient-memory problems. Mass storage support has been raised to 220MB. Newer OmniBook 300s will also have these modifications. All OmniBooks come loaded with Microsoft Word for Windows, Microsoft Excel, and LapLink Remote Access; RAM expands to 12MB.

The next challenge for HP is the unit's nonbacklit reflective screen. HP's is a better screen than most and is a major energy saver, but many find a reflective screen too low in contrast and too difficult to read in certain lighting conditions. Currently, however, HP has no plans to change it.

• List price: *HP OmniBook 425 Superportable PC, 40MB hard disk, $2,125; 10MB flash disk, $2,375. Hewlett-Packard Co., 1000 NE Circle Blvd., Corvallis, OR 97330; 800-443-1254, 503-757-2004; fax, 503-750-5488.*

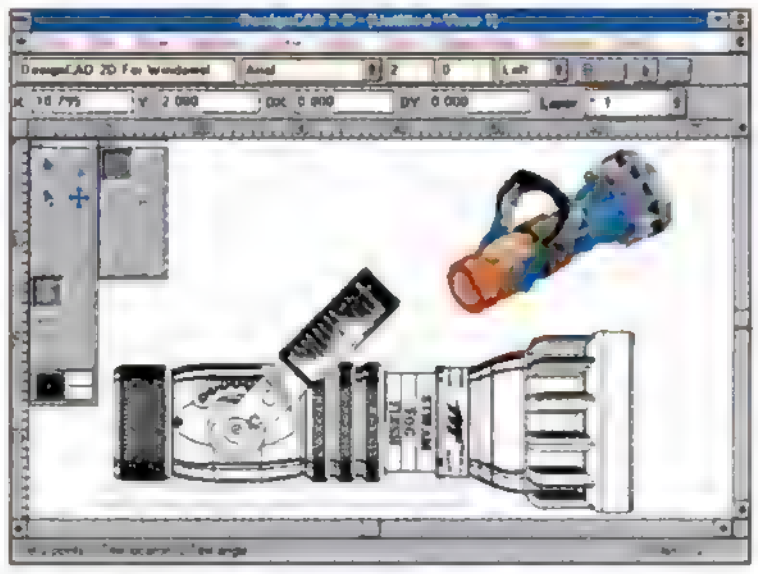
Circle 411 on reader service card

NEW

DesignCAD Hits Windows

In porting its CAD package, DesignCAD 2D for DOS, to Windows, **American Small Business Computers** has improved on the original.

Named DesignCAD Windows, Release 7.0, the package offers lots of tweaks, including the ability to open an unlimited number of windows and to open the program multiple times, a Hot Tool Box that lets you customize your button box, and full cut, copy, and paste functions in either .BMP or META. You can print without leaving the program, and you can set layers as visible but not editable; that way, you can see your work and make changes on different layers without affecting the noneditable layers.



You can have your button toolbars the way you want them with DesignCAD Windows.

The Windows version also adds the ability to undo all Edit commands, not just the last entity; supports TrueType fonts, and offers an on-line manual.

• List price: *DesignCAD Windows, $349. American Small Business Computers Inc., One American Way, Pryor, OK 74361; 918-825-7555; fax, 918-825-6359.*

Circle 414 on reader service card

NEW

46 New Deskpros, Presarios, And ProLineas from Compaq

A slew of new computers is coming out of Houston as **Compaq Computer Corp.** adds 46 different configurations of Deskpros, Presarios, and ProLineas to its stable.

Photography by Thom O'Connor

For business users, the Deskpro XE offers 486- and Pentium-based options with Compaq's QVision local-bus video and enhanced business audio for voice annotation in files, proofreading with a voice-back feature, and voice control of applications. On 486SX models, 4MB of RAM (upgradable to 32MB) is standard; all others come with 8MB. 486DX2 models expand to 32MB of RAM, and Pentium systems allow up to 136MB. Hard disk choices range from 170MB to 525MB, and CD-ROM drives are also available. All the 486-based models are Energy Star–compliant; the Pentium systems are not.

Compaq is also adding to its Presario family with the new 800 Series offered in minitower cases. In the Presarios, CPUs range from 486SX/33s to 486DX2/66s; hard disks range from 270MB to 340MB. The units also come in a multimedia (CDS) version that has a double-speed CD-ROM drive, a 16-bit sound card, external speakers, a microphone, and a choice of software. The $1,699 Presario 633 CDS, the only one offered in a desktop case, uses the 486SX/33 processor with a 200MB hard disk and adds an internal modem to the standard 800 CDS Series configuration.

To serve networking needs, Compaq presents the ProLinea Net1/25s, an Energy Star–compliant all-in-one box with preinstalled Ethernet or TI SuperEagle Token-Ring network interface cards, 4MB of RAM expandable to 20MB, hard disks from 100MB to 200MB, and CPUs ranging from 486SX/25s to 486DX2/66s. The ProLinea MT line, offered in either a minitower or desktop case, has more expansion options, with RAM ranging up to 64MB and hard disks from 270MB to 525MB. Multimedia is also available for MTs.

• List price: *Compaq Deskpro XE, $1,499 to $3,199; Presario 800 and 800 CDS Series, $1,649 to $2,299; ProLinea Net1/25s, starts at $1,349; ProLinea MT and MT CDS, $1,649 to $2,599. Compaq Computer Corp., P.O. Box 692000, Houston, TX 77269; 800-345-1518, 713-378-8820; fax, 713-378-1442.*
Circle 415 on reader service card

IMPROVED

Layouts Made Easier with QuarkXPress 3.3

Quark Inc. has updated its layout program, QuarkXPress, adding features and coordinating the Macintosh and PC upgrades for the first time—a policy that the company plans to continue.

Among other things, QuarkXPress 3.3 adds two new spot color models, Toyo and DIC, and can import JPEG and PhotoCD Pac files. It can create text boxes in a variety of shapes using preprogrammed shapes and a custom option. It also has a better document layout palette that lets you apply a master page to a single document page or copy and delete selected document and master pages, a useful function in documents with different sections. This version also adds fax drivers and enhanced PostScript printer drivers.

QuarkXPress 3.3 creates various text box shapes.

Users who bought QuarkXPress after April 4, 1993, and send in their registration disk by year's end can receive the upgrade free.

• List price: *QuarkXPress 3.3 for Windows, $895, upgrade only, $195. Quark Inc., 1800 Grant St., Denver, CO 80203; 800-788-7835, 303-894-8888; fax, 303-894-3399.*
Circle 416 on reader service card

BRIEFS

HARDWARE

MiniStor Peripherals Corp. has released two PCMCIA products, one a 1.8-inch Type-III Plus (13.5-mm-high) PCMCIA 128MB hard disk, $699, the other a docking station of sorts called DockIt Socket, $249. The DockIt is an add-on PCMCIA slot (Type I, II, or III) for PCs; it fits any open 3.5-inch drive bay and facilitates information transfer between portables and PCs. 800-943-0165, 408-943-0165

The newest 4-ppm laser printer from **Okidata** is the OL410e. Priced at $899, it offers 600-dpi resolution, an improvement over its 300-dpi predecessor, the OL400e. The OL410e has 12 resident scalable fonts, 2MB of RAM, and parallel and serial interfaces with auto-switching. This small-footprint printer also has PCL 5 emulation, and like the OL400e, is Energy Star–compliant. 800-654-3282, 609-235-2600.

There's a new 16-page-per-minute network laser printer on the market from **ALPS Electric (USA) Inc.** The $3,295 ALPS LSX1600e comes with 27 fonts, handles PCL 5 with PostScript 2 optional, and has automatic emulation switching and port sensing. It also has two paper bins that handle universal paper sizes and a built-in envelope feeder. The bins can be used simultaneously. Resolution goes to 300 by 300 dpi, and an XIO port is standard. 800-825-2577, 408-432-6000

PC PowerPhone, $395, from Digital Promotions Inc., is a hardware and software solution designed to turn your PC into a telephone. You supply the handset, plug it into the expansion board, and the device is operational. It has standard phone features, plus extras like on-screen dialing and editing, a call duration timer for billable calls, an auto-scan that scans for numbers in a given screen, and a cassette interface that lets you tape conversations. 800-375-8879, 407-737-7779.

Datalogic Corp. provides another solution for those who want to let their PCs make and track calls. Its $139 Digi-Dial is a wireless radio-based hardware interface between PCs and most tele-

IMPROVED

A Smarter Way to M.Y.O.B.

Geared for small and growing businesses, **Best!Ware**'s (formerly Teleware Inc.) M.Y.O.B. 4.0 accounting software offers a number of improvements over its predecessors.

One of the major improvements is the optional Integrated Payroll Command Center. It has a smart tax engine to help you figure out how much any employee owes in taxes based on his place of residence, and it can calculate earnings, deductions, taxes, and employer expenses as you write out paychecks. Then M.Y.O.B. will update the information in the proper accounts. It also provides a customizable paycheck, as well as 940 and 941 reporting to facilitate tax filing.

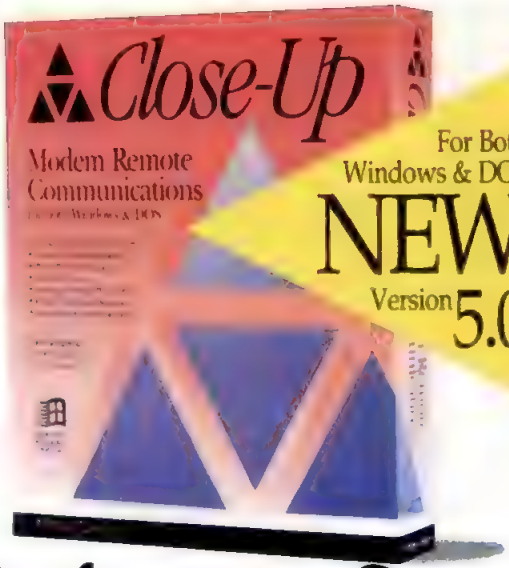
Other improvements include a sales and purchases feature that lets you save certain invoices or purchase orders as recurring, and TAL (timeslips accounting link) support.

• List price: *M.Y.O.B. Accounting 4.0, $99.95; M.Y.O.B. Accounting with Payroll 4.0, $199.95. Best!Ware, 300 Roundhill Dr., Rockaway, NJ 07866; 201-586-2200; fax, 800-322-6962, 201-586-8885.*
Circle 417 on reader service card

WinBench™ 3.11 by Ziff-Davis Labs Tests Remote Windows™ Speed

This graph shows the speed of the three leading remote control programs when transferring Windows screens. As you can see, Close-Up handles more pixels, faster, meaning you spend less time waiting for Windows screens.

The industry standard test, WinBench 3.11, is perfect for testing the speed of remotes. It is an accurate measure of video throughput. Video throughput is the limiting factor in remote operations, because remote programs must transmit Windows video functions from one PC to the other.



New Remote Software Sets Windows Speed Record

Communicate Faster & Easier

Close-Up® lets you communicate faster & easier with five exciting technology firsts.

Close-Up is the only remote communications software that won both PC Magazine's coveted "Editors Choice" and PC World's "Best Buy" awards. Now Close-Up has a new faster & easier version that allows you to view and control another PC by modem as if you were there!

Technology Firsts

1. *AI Video Compression*
2. *Photographic Memory*
3. *Non-Intrusive Technology*
4. *Expert System*
5. *Video Translation*

Why Is Close-Up So Fast?

Close-Up learns as it works. It uses AI (Artificial Intelligence) to compress all Windows video function calls. That's why Close-Up does so well in Windows Benchmark tests (see WinBench 3.11 chart).

Close-Up uses its revolutionary Photographic Memory™ so that once Close-Up has seen all or part of a Windows screen, it's memorized. Then as screens change, Close-Up only transmits new unmemorized data. Incredibly, with this technology *Close-Up gets faster & faster the longer you use it.*

What Remote Companies Haven't Told You

Other remote programs permanently slow Windows and usually reduce your video resolution and depth of color, even when they are not in memory. That's because they permanently change your system.ini file. Close-Up's breakthrough Non-Intrusive Technology does not modify any of your sensitive Windows files including the system.ini. Close-Up is the only remote that when not in use, allows Windows and your PC to run at normal optimal levels.

WinBench scores (average of 10 runs):
Close-Up 1,613,118
pcAnywhere 194,093
CarbonCopy 168,397

Expert System Makes Communications Easy

You don't have to be a communications expert to get the results of one. Close-Up has an Expert System that automatically analyzes system components and configures your system for optimal speed.

Video Translation

With Close-Up, dissimilar PCs can easily connect, because Close-Up senses the video capabilities of both PCs and automatically displays Windows in a video mode compatible with both sides.

RISK FREE GUARANTEE MONEY BACK

Risk-Free Offer!

Try Close-Up. If you're not absolutely convinced that Close-Up 5.0 is the fastest remote program, we'll give you your money back!* Order Close-Up Host & Remote, a complete system, for only **$199.95**

Upgrade your current or competitive remote program to new Close-Up 5.0. Get both sides, Host & Remote, for only **$69.95**

Order Today 805-964-6767

Norton-Lambert®

We invite you to reproduce this test. We used two identical Gateway 4DX2-66V's with 66-MHz Intel 486DX2-66 CPUs, 16 MB RAM, 256KB RAM cache, 340 MB HD, IDE controller, no hardware disk cache. Video: Local Bus ATI Ultra Pro with 2MB VRAM, 640 by 480 pixels, 16 colors, VGA.DRV dated 3/10/92. Monitor 72 Hz. MS-DOS 5.0, SMARTDRV 2 MB cache. Modems: two 14,400 baud V.32bis. Test performed without verification by Ziff. All products are shipping versions. WinBench trademark of Ziff Communications Co. Windows trademark of Microsoft Corp.

*60 day money-back guarantee if purchased directly from Norton-Lambert. Offer expires 6/30/94. All prices in US Dollars. Prices exclude shipping.

© 1994 Norton-Lambert Corp., P.O. Box 4085, Santa Barbara, CA 93140 USA Phone (805) 964-6767 Fax (805) 683-5679

CIRCLE 346 ON READER SERVICE CARD

The PowerPC™ is coming soon to a

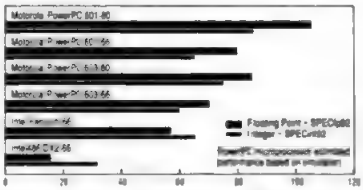
Buckle up and hang on tight.

Personal computers based on PowerPC microprocessors from Motorola are coming your way. And when they arrive, they're going to be the fastest, most powerful personal computers you've ever seen.

Computers based on PowerPC microprocessors will run circles around machines based on the Intel486™ DX2 microprocessor. They'll whip those based on the Pentium™ microprocessor, too, especially in crucial floating point performance. And they'll cost no more than today's PCs.

Right out of the gate, computers based on PowerPC microprocessors will be able to run the most popular software operating systems, including AIX,® Macintosh® System 7, MS-DOS,® Novell® NetWare® 4, OS/2,® the PowerOpen® Environment, Solaris® and Windows NT.™

You'll be able to choose application software from leading vendors like Adobe,® Aldus,® Autodesk,® Banyan,® Claris,® Frame,® Informix,® Ingres,®



Computers powered by Motorola's PowerPC microprocessors will run new generation software a great deal faster than computers powered by Intel's Pentium microprocessors.

PowerPC microprocessors. Changing

*Via emulation. Speed comparisons are based upon press reports of performance of the 66MHz versions of the Pentium and Intel486 DX2 microprocessors as announced by Intel. © 1994 Motorola, Inc. Motorola and the (M) are registered trademarks of Motorola, Inc. PowerOpen trademark of IBM Corporation. Macintosh is a registered trademark of Apple Computer, Inc. Microsoft and MS-DOS are registered trademarks and Windows NT is a trademark of Microsoft Corporation. Intel486 and Pentium are trademarks and Intel is a registered trademark of Intel

nicroprocessor computer near you.

Choose the operating system that meets your needs. There will be computers based on PowerPC microprocessors to run them all.

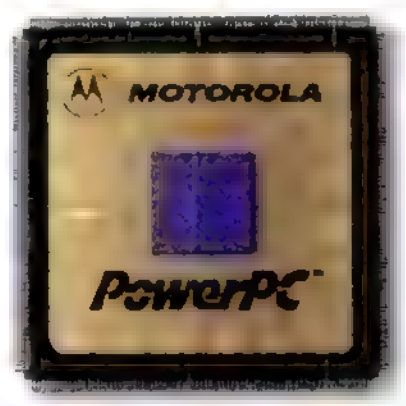
Microsoft,® Oracle,® Sybase,® Symantec® and WordPerfect.® And with the superior floating point performance of computers based on PowerPC microprocessors, you'll run that software faster and more efficiently than will those based on Intel® microprocessors.

Also, you can expect the performance advantage of computers based on PowerPC microprocessors to increase over time. Because while the Pentium microprocessor is bumping the limits of its 15-year-old architecture, the streamlined PowerPC Architecture™ is just getting started.

"The PowerPC microprocessor changes the rules of the game. Historically, graphics applications have done as much as possible in integer arithmetic because previous processors have had better performance there. What we're seeing with the PowerPC is a move to floating point for our graphics applications and getting better performance."

— Jerry Barber
Chief Technical Officer, Aldus Corporation

As 1994 unfolds, you'll see new workstations and desktop computers based on the PowerPC 601™ microprocessor as well as notebooks and low-cost desktop computers based on the PowerPC 603™ microprocessor.



Now we can't tell you exactly when the new computers based on PowerPC microprocessors will be available, but your computer company probably can. So call them. Or for a copy of our latest PowerPC Microprocessor Update, call 1-800-845-MOTO.

PowerPC microprocessors from Motorola. The fastest computers you can buy are fast approaching.

the course of computing. For the better.

a trademark of the PowerOpen Association. PowerPC, the PowerPC logo, PowerPC Architecture, PowerPC 601 and PowerPC 603 are trademarks and AIX is the registered trademark of IBM Corporation and are used by Motorola under license from IBM Corporation. OS/2 is a registered trademark of IBM Corporation. Solaris is a registered trademark of Sun Microsystems Computer Corporation. Novell and NetWare are registered trademarks of Novell, Inc. All brand or product names appearing in this ad are either trademarks or registered trademarks of their respective owners. All rights reserved.

CIRCLE 338 ON READER SERVICE CARD

IMPROVED

Better OCR with Caere

OmniPage 5.0 and OmniPage Professional 5.0 are the latest releases from **Caere Corp.**, offering better user interfaces, improved recognition capabilities, and greater control over the ORC process.

Both have Language Analyst, a subprogram that uses linguistic-analysis algorithms to create probabilities for character determination. Professional 5.0 adds Tru Page processing, which lets you keep the format of the page as it is scanned in, 3D OCR (a technology that uses gray-scale information during recognition), and 24-bit color image editing. Professional 5.0 also supports MAPI in addition to Twain.

• List price: *OmniPage Professional 5.0, $695; OmniPage 5.0, $495. Caere Corp., 100 Cooper Ct., Los Gatos, CA 95030; 800-535-7226, 408-395-7000; fax, 408-354-2743.*
Circle 418 on reader service card

NEW

Pentium and PCI from ALR

The next step in **Advanced Logic Research**'s Evolution V line is its ST with PCI, a Pentium-equipped minitower PC with PCI bus technology. The system comes with eight expansion slots (four PCI, four ISA), 8MB of RAM expandable to 192MB, 256K cache with 512K optional, and a 32-bit fast SCSI-II interface. The tower has room for six drive bays, four of which are external. Both 60- and 66-MHz versions are available, and ALR has implemented its own Pentium Thermo management system to prevent overheating. You can choose from a variety of hard disks and CD-ROM options as well.

For those interested in using the Evolution V ST with PCI as a network server, ALR provides a number of security features, including multiposition locking on the front panel, a keyboard-inhibit switch to protect the keyboard and mouse, and a chassis lock. There are also three levels of password security and a special network server mode to ensure safe NetWare operation.

A new ST Pentium system, the Evolution V with VL-Bus, is also available. System specs are the same as for its sister model except that memory goes up to only 128MB and of the eight expansion slots, three are VL-Bus.

•List price: *Evolution V ST with PCI, starts at $3,295; with VL-Bus, $2,995. Advanced Logic Research Inc., 9401 Jeronimo, Irvine, CA 92718; 800-444-4257, 714-581-6770; fax, 714-581-9240.*
Circle 421 on reader service card

BRIEFS

HARDWARE

phone PBX systems. A receiver connects to the phone, and a transmitter connects to any serial port on your computer. It works with no external power and responds to a standard Hayes AT command set. No software is included. 800-397-2200, 616-698-3030.

EXPANSION CARDS

Xing Technology Corp. has reduced the price of its ISA-based XingIt! video capture and compression board from $795 to $499. The board is capable of real-time 30-frame-per-second MPEG capture and 30-fps playback in software only in a 320- by 240-pixel window. Additional software can bring the display to full-screen. 800-294-6448, 805-473-0145.

Aztech Labs covers video and audio with the Video Galaxy card, $300, and the Sound Galaxy Basic 16 audio card, $169. Video Galaxy is a 16-bit desktop TV/video interface card that lets you capture, store, edit, and export scalable digital video images. The Galaxy Basic is an entry-level 16-bit stereo card compatible with most major sound standards; it comes with headphones, a variety of software, and a MIDI port that doubles as a game port 800-886-8879, 510-623-8988

DSP-based GameWave 32, $179, is **Orchid Technology**'s latest, low-cost entry into the sound card market. It offers 16-bit audio, 1MB of sound samples on-board, and dual CD-ROM interfaces. It also has a joystick port, a MIDI interface, and a stereo speakers output line. 800-767--2443, 510-683-0300.

miro Computer, a large German-based company, has entered the U.S. graphics market with four new graphics card families. Its low-end card, miroCrystal 8s, $229, offers 256 colors in SVGA resolution with 8-bit color or 800-by-600 resolution with 16-bit color; it has 1MB RAM expandable to 2MB. miroCrystal 16si, $379, offers 1,024-by-768 resolution with 16-bit color or 640-by-480 resolution with 24-bit color, 2MB VRAM standard. The next step up is the miroCrystal 24s card, $699, with 24-bit color at 1,024-by-768 resolution and 3MB

NEW

StudioScan: Affordable Entry-Level Color Scanner

Agfa Division of Miles has released its first entry-level scanner targeted primarily at small businesses, home offices, and emerging desktop markets.

StudioScan is the latest in Agfa's Electronic Desktop Solutions scanner line. It offers 300- by 600-pixel-per-inch optical resolution and 6-ppi to 2,400-ppi scanning resolution; single-pass scanning; a $500 transparency option; and color, continuous-tone, halftone, and line-art scanning modes. Maximum scan area is 8.5 by 14 inches.

The StudioScan from Agfa handles letter- or legal-sized paper and is available on both the PC and Macintosh platforms.

StudioScan includes three software packages: Agfa's FotoSnap (automated scanning software), FotoTuneLE (color-management software), and Adobe PhotoshopLE (image-editing software). Agfa FotoLook drivers also come with the scanner to help you control settings like white/black point, exposure, tone curve, and descreening.

Both Mac and PC platforms support StudioScan. The PC version is Twain-compatible and includes a SCSI board.

• List price: *StudioScan, $1,050. Miles Inc., Agfa Division, 200 Ballardvale St., Wilmington, MA 01887; 800-685-4271, 508-658-5600; fax, 508-658-4193.*
Circle 419 on reader service card

NEW

Smoother Running from File To Updated File

MBS Technologies Inc. presents a Windows version of its FileRunner, a software solution for those needing to synchronize

Power Packed Upgrades.

POWER SUPPLIES

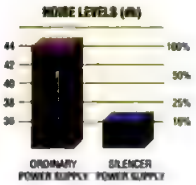
"The premier power-supply maker"
John Dvorak, *PC Magazine*, March 30, 1993
"The only company to go to for a power supply"
Jerry Pournelle, *Byte*, April 1993

STANDARD UNITS

These UL/CSA approved, fully tested power supplies are the best basic units available.

STANDARD 205 SLIM $89
STANDARD 220 DESK/TOWER $89

ULTRA-QUIET UNITS



Unrattle your nerves with an ultra-quiet **Silencer** power supply. Appreciated by users **since 1986**, their high-efficiency fans and low-turbulence circuitry reduce noise by up to 84%! A must for home office or *multimedia* applications.

SILENCER 205 SLIM $119
SILENCER 220 DESK/TOWER $129
SILENCER 270 DESK/TOWER $179

HIGH-PERFORMANCE UNITS

Upgrade your computer with one of our premium **Turbo-Cool** power supplies—the choice of PC professionals. You'll get 50% - 100% more power, built-in line conditioning, super-tight regulation, ultra-clean output, a high-capacity cooling fan, UL/CSA/TUV, a 2-year warranty for 300W models, and a **5-year warranty** for the 450! Ideal for high-end workstations and network file servers.

TURBO-COOL 300 SLIM/BABY $169
TURBO-COOL 300 DESK/TOWER ... $189
TURBO-COOL 450 DESK/TOWER ... $349

SOLID-STEEL CASES

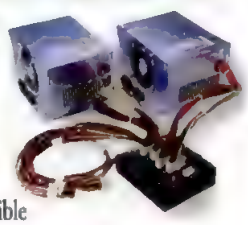
Give your computer a professional, high-tech look with one of our premium-quality, **USA-made,** all-steel cases. They're rigid—unlike light-weight imports—so the PC's components are always properly aligned and grounded. You'll enjoy easy system access, and with room for up to **18 drives,** there's real expandability!

	Desktop	Tower	Monster
Exposed Drive Bays:	5	6	13
Total Drive Bays:	7	8	18
Motherboard Capacity:	1	1	2
Power Supply Capacity:	1	1	2
Cooling Fan Capacity:	2	3	6
Filtered Air Inlet:	Yes	Yes	Yes
Lockable Front Door:	Yes	No	Yes
Beige or Black Finish:	Yes	Yes	Yes
Meets FCC-B Specs	Yes	Yes	Yes
Made in USA	Yes	Yes	Yes

SOLID-STEEL DESKTOP CASE..... $175
SOLID-STEEL TOWER CASE $295
SOLID-STEEL MONSTER CASE..... $895

REDUNDANT POWER

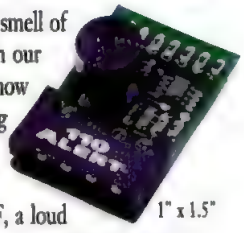
Eliminate the risk of network downtime or data loss due to power supply failure with the **TwinPower 900** redundant power system. It delivers high-capacity, fault-tolerant power to your entire network server. Consists of two **Turbo-Cool 450** power supplies in parallel, utilizing a special power-management interface module. A must for *mission critical* LANs.



- 900 watts peak power
- 100 X more reliable than a single-unit
- load-sharing design
- hot-swap capability
- 5-year warranty
- monster-case compatible

TWIN-POWER 900 ..... $995

OVER-TEMP ALARM

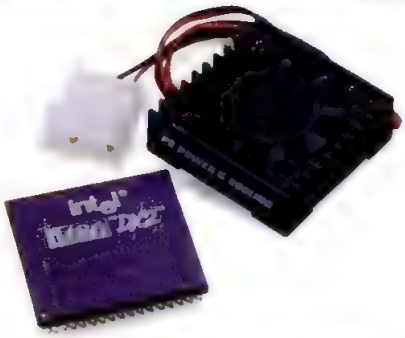


1" x 1.5"

Don't wait for the acrid smell of burnt components! With our new **110 Alert,** you'll know if your PC is overheating *before* damage occurs. Should the computer's temperature reach 110°F, a loud alarm warns you that a fan has failed or that the cooling system is inadequate to handle that extra hard drive or other peripheral you may have added. Compatible with any computer, the inexpensive **110 Alert** is compact, easy to install, and so reliable, it carries a lifetime warranty.

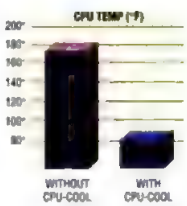
110 ALERT $29

CPU COOLERS



It's a fact. 486 chips run hot, often exceeding 185°F! Now, you can cool your 486 to a safe 85°-95°F with our popular **CPU-Cool.** It prevents random system errors and other heat-related problems. Consists of a mini-fan embedded in a die-cast heat sink that easily mounts on the CPU. Powered by a spare drive connector. Effective, inexpensive insurance!

- cools CPU 70° - 100°F
- prevents system errors
- adds years to CPU life
- thinner, quieter, and better-built than cheap imported imitations.
- safe, simple installation



CPU-COOL (FOR 486s) **$29**
PENTACOOL (FOR PENTIUMs) **$39**

PC POWER & COOLING, INC.

5995 Avenida Encinas, Carlsbad, CA 92008 • (619) 931-5700 • (800) 722-6555 • Fax (619) 931-6988

We accept Visa, MC, COD, or PO on approved credit. Warranty period: Five years for Twin Power and Turbo-Cool 450. Two years for Turbo-Cool (except 450), Silencer, and CPU coolers. One year for all others (except 110 Alert). Hours: 7 a.m. - 5 p.m. (PT) Mon. - Fri. Silencer, Turbo-Cool, TwinPower, CPU-Cool, PentaCool, and 110 Alert are trademarks or registered trademarks of PC Power & Cooling, Inc. ©1993 PC Power & Cooling, Inc.

CIRCLE 080 ON READER SERVICE CARD

more than one version of a file residing in more than one computer.

FileRunner for Windows retains many of the features of its DOS predecessor, like Tru• Sync, which automatically identifies and transfers updated and new files and synchronizes deleted files across machines. It also has Overwrite Safeguard and provides an audit trail of all transfers. New to the Windows version are a better user interface, the ability to tranfer an unlimited number of files, discrimination capability (which lets you include or exclude files or directories), and improved data compression and virus checking. Floppy disks, removable disk drives, or other mountable drives are used for transfer.

• List price: *FileRunner for Windows, $49.95 (limited time), then $99.95. MBS Technologies Inc., 4017 Washington Rd., #4000, McMurray, PA 15317; 800-860-8700, 412-941-9076; fax, 412-941-7076.*
Circle 420 on reader service card

IMPROVED

dBASE Compiler for DOS 2.0 Generates 32-Bit .EXE Files

Borland International, which originally shipped the dBASE Compiler for DOS last March, has now shipped the dBASE Compiler for DOS, Version 2.0, a significant upgrade. The new version generates full 32-bit executables and, as a result of dynamic virtual memory management, can now access up to 4GB of extended memory. It also has a menu-driven interface.

The new dBASE Compiler is faster, generates smaller files (half the size of dBASE IV files and up to twice as fast), and is much easier to use. Fortunately, the new Compiler remains 100 percent compatible with dBASE III, dBASE III Plus, and dBASE IV.

• List price: *dBASE Compiler 2.0 for DOS, $495; through January 31, 1994, $199.95. Borland International Inc., 100 Borland Way, Scotts Valley, CA 95067; 800-352-6767, 408-461-9000; fax, 800-822-4269.*
Circle 422 on reader service card

NEW

New Pentium Dimension to Dell

Dell Computer Corp. has released its Dimension XPS P60, a 60-MHz Pentium system with PCI bus technology and 64-bit architecture. The system is equipped with 8MB of RAM expandable to 128MB, 450MB hard disk, double spin CD-ROM drive, 3.5-inch floppy disk drive, 1MB PCI video card and an SVGA monitor. The medium desktop case has five drive bays with seven expansion slots (three PCI, four ISA). Options include Peavey speakers, a Sound Blaster 16 audio card, an MPEG full-motion video card, and storage up to 1GB with a SCSI interface. Dell offers a next-business-day on-site warranty and 24-hour, seven days a week phone technical support.

• List price: *Dell Dimension XPS P60, $2,999. Dell Computer Corp., 9505 Arboretum Blvd., Austin, TX 78759; 800-289-3355, 512-338-4400; fax, 512 728-4238.*
Circle 436 on reader service card

BRIEFS

EXPANSION CARDS

VRAM standard. Last and best is miroCrystal 32s, $899, with 4MB VRAM, 16-bit color at 1,408-by-1,024, and 24-bit color at 1,024-by-768. All cards use S3 chips and are available in ISA, EISA, PCI and VESA versions. 800-249-6476, 408-727-1558

SOFTWARE

Software Illustrated Inc. has released MapLand, an add-on for Excel, $99 95. It becomes another toolbar within Excel and lets you chart data on a map inside your spreadsheet. You can select a map from MapLand's 14 worldwide Geographics Workbooks, then edit, display, and print it in different formats. 510-463-9898

Tax Mate, a special-edition DOS or Windows version of Parsons Technology's Personal Tax Edge, is available free with $8 for shipping to the first 250,000 people who phone in an order. It is geared for individual tax returns and includes forms like 1040 and 2441. Parsons will reimburse users for any IRS penalties resulting from computational errors in the software. 800-682-9628, 319-395-9626.

Heartbeat Software's offers computerized help for prospective parents with Oh, Baby!, a new $49.95 software (DOS or Windows) containing 100,000 names. It lets you search for names with specific criteria like gender, ethnicity, or meaning. Its random name generator groups selected names from the general or user-made list with the family name for trial runs. 800-488-9609, 617-891-3323.

Symantec Corp. has released two updated versions of its popular antivirus software, The Norton AntiVirus 3.0, $129, and AntiVirus for NetWare $995 Both can identify and repair known and unknown viruses, and both have access to all of the NCSA's libraries. Version 3.0 supports all major network operating systems. The special NetWare version also features centralized controls for remote or local configuration, customizable virus-alert options, and automatic report generation. 800-441-7234, 408-253-9600

NEW

Health Policy PC-Style

The new Health Care proposals floating around Washington have created almost as much confusion as they have controversy. A new product from **Maxis Business Simulations** in conjunction with The Markle Foundation called SimHealth may help.

Though the company's better-known simulations are games like SimCity, SimHealth was developed by Maxis's business division, a section of the company that has produced more-serious simulation programs like SimRefinery, a simulation of oil refinery operations.

The state of Main Street in SimHealth lets you know whether your policies work well or not.

SimHealth works by placing you in the role of the elected president, then lets you choose the values that serve as your basis. It gives you some information about different policies and offers feedback on how well your policies work, how faithfully you have stuck to your values, and how pleased your voters are with you. Though it can be used by one person, it's intended for groups, where it can spark dialog and discussion that will help people understand the intricacies of policy-making. A record feature lets you share the results of a run with other users.

• List price: *SimHealth, $29.95 (direct), $39.95 (retail). Maxis Business Simulations, SimHealth, P.O. Box 2096, Woodinville, WA 98072; 800-824-2643, fax, 206-489-3446.*
Circle 423 on reader service card

Around the world over nine million business users share a common practice. They back up and store important data on quarter-inch data cartridges. And the brand they choose most is 3M. For good reason.

3M data cartridges are built for reliability—from the tape formulation to the cartridge itself. Whatever capacity you need—formatted or unformatted—3M cartridges are ready to save the day with proven performance. That's why more businesses protect important information on 3M brand data storage products than any other brand in the world. For more information and your free "Data Security Handbook" call 1-800-888-1889, ext. 43.

The common denominator of business around the world.

3M data cartridges require compa[illegible]3

3M *Reliability*

[illegible]EADER SERVICE CARD

The most complete hand scanning system you can find in a box. Or a store. Or in town. Or in the world for that matter.

Quickly scan text and images into your computer with the OmniScan 256 grayscale scanner. OmniScan produces true 8-bit grayscale at 400 dpi and features advanced illumination technology and solid tracking for the most accurate scanning.

With OmniScan, you can send, receive, OCR, and compress faxes right from your computer using Caere's FaxMaster technology. All you need is a fax modem. OmniScan does the rest.

Scan directly into any application with OmniPage Direct. Direct employs Caere's AnyPage OCR technology to provide superior accuracy on a wide variety of documents. Font sizes, styles, and formats are no problem for OmniScan Direct's OCR.

Image Assistant GS makes grayscale image editing and enhancement a snap. The "Assist Mode" displays sample image variations right on your computer screen. All you have to do is choose the one that works best for you. And to help you add your own personal touch to images, Image Assistant GS features a complete set of editing tools and features.

Caere's full integration of grayscale scanning, OCR, image editing, and fax capabilities make OmniScan the most complete hand scanning solution found anywhere. Now that you have discovered it, here's how to locate the dealer nearest you: 1-800-535-SCAN.

Featured at these resellers:

MICRO CENTER — THE COMPUTER DEPARTMENT STORE®

MicroWAREHOUSE®

COMPUTER City SUPERCENTER

EGGHEAD SOFTWARE

caere

Caere and OmniScan are registered trademarks of Caere Corporation. The Caere logo, OmniPage Direct, AnyPage, Image Assistant, and FaxMaster are trademarks of Caere Corporation. © 1993. All rights reserved.

CIRCLE 097 ON READER SERVICE CARD

For Your Information.

Purchase now and receive a free upgrade to OmniPage 5.0 or OmniPage Professional 5.0.

Introducing a revolutionary concept in OCR. Lower prices.

$695 SRP

Now you can get OmniPage® Professional, the business professional's choice in OCR, for only $695. That's a $300 reduction. And if that isn't enough, you'll also receive a free copy of Image Assistant™, Caere's image editing software, while supplies last.

$495 SRP

Thinking about buying a scanner? Well, there's no better time than the present with a $200 reduction on OmniPage. Because not only is OmniPage easy-to-use, it also handles just about any layout, font or text element.

$295 SRP

Now OmniPage Direct is an unbeatable value by any standard. Direct adds the highly accurate text recognition you require directly to your working applications.

If you've been waiting to get the best OCR available, the wait is over. Because now you can get the OmniPage family of products, the accurate, easy-to-use OCR software, at a price that's down to earth. So no matter what your needs, OmniPage Professional, OmniPage, or OmniPage Direct has the OCR solution you need, at the price you want. For more information on any member of the OmniPage family, call **1-800-535-SCAN** today. Offer valid only in U.S.A. and Canada.

omniPAGE®

caere

For Your Information.

Caere and OmniPage are registered trademarks of Caere Corporation. The Caere logo and Image Assistant are trademarks of Caere Corporation. ©1993. All rights reserved.

Introducing Delrina Communications Suite. At last, powerful fax and communications software that work together.

Get a suite deal on WinFax PRO™ and new WinComm PRO™

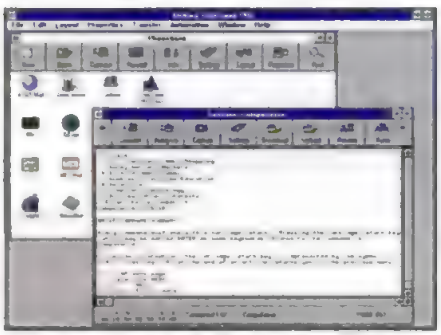
Now you can get the world's best-selling fax software together with a powerful new communications application in one economical package: New Delrina Communications Suite™.

Together, WinFax PRO and new WinComm PRO set a new standard for ease-of-use and integration. In fact, for the first time you'll be able to run both fax and data communications software without the hassle of serial port conflicts.

New WinComm PRO - the easy way to access on-line services and transfer files

With WinComm PRO's friendly graphical interface and intuitive icons, access to advanced communications is easier than ever. Lots of pre-defined scripts are included to automatically connect to all major on-line services, including CompuServe, MCI Mail, AT&T and GEnie. Plus, it's a cinch to record log-on scripts of your own. Or use the powerful scripting language to customize and automate all your on-line sessions. You'll find support for all the popular terminal emulations. As well as additional support for just about every file transfer protocol you might need, including Xmodem, Ymodem, Zmodem and Kermit. Plus on-line virus protection.

Only WinComm PRO gives you power and flexibility in data communications, with the same ease-of-use that made WinFax PRO number one in PC faxing.



Like award-winning WinFax PRO, new WinComm PRO gives you push button access to its powerful features.

WinFax PRO - the best way to send, receive and manage faxes

Plus, you get Delrina's award-winning WinFax PRO. With over 2 million copies of WinFax sold worldwide, we think you'll agree it's the best way to send faxes from any Windows application. It even lets you receive faxes in the background, organize your faxes with a detailed log, design your own cover sheets, and convert faxes into word processing documents with OCR.

PC Computing USABILITY APPROVED 1993

1993 ANNUAL WINDOWS WIN AWARD 1993

MVP 1992

As a special bonus, you get a $50 credit toward the Delrina Fax Broadcast™ Service — which lets you send the same fax to a group of people using our phone lines instead of tying up yours.

Best of all, the Delrina Communications Suite is yours for about the same price as the leading communications software alone.

To order, or find out more about upgrading from WinFax PRO or WinFax LITE™, call today.

DELRINA
1-800-268-6082

Delrina, WinFax PRO, WinFax LITE, WinComm PRO, Delrina Communications Suite and Delrina Fax Broadcast are trademarks of Delrina (Canada) Corporation. All other product names are copyright and registered trademarks/tradenames of their respective owners. © 1993 Delrina (Canada) Corporation. All rights reserved.

CIRCLE 250 ON READER SERVICE CARD

Read Only

REVIEWS OF THE LATEST BOOKS FOR THE PC USER

Edited by Lance Ulanoff

Computer Learning in Theory...

BY ALFRED POOR

When you boot up a new system, where do you begin to learn how to use its tools, and what happens as you learn? Now does that type of learning experience bear any resemblance to what goes on in the typical elementary school?

As Seymour Papert, inventor of the LOGO language and author of the classic *Mindstorms*, explains in his fascinating new book, *The Children's Machine: Rethinking School in the Age of the Computer*, the chasm between these two worlds of learning is far too wide.

Laced with rich anecdotes of the learning adventures of children, the book concludes that an education based on a "master plan" can no more succeed than can the centrally controlled economy of the former Soviet Union. Where we now teach a hierarchical curriculum of narrowly channeled goals, Papert advocates learning through exploration, using everything from Lego building blocks to kitchen utensils.

But the key to his premise is that computers make a new kind of school possible. If you have a child in school, do you know the quantity and quality of computers in your child's school, and how they are used? It's possible that they could be put to better use by helping the students learn the way people learn in the real world.

The Children's Machine takes on a radical tone as Papert cites Ivan Illich's landmark book, *Deschooling Society*, and rails against the entrenched educational systems that make it nearly impossible for a teacher to experiment or innovate in the classroom. Still, one could implement many of Papert's ideas without dismantling the existing public school system.

• **The Children's Machine: Rethinking School in the Age of the Computer,** *by Seymour Papert, $22.50. BasicBooks; 800-331-3761. ISBN: 0-465-01830-0.*

Circle 401 on reader service card.

Officially Fun

Authors Steve and Ruth Bennett have written three chatty, engaging, and handy books that let you take Broderbund Software's popular children's software to the max. *The Official Playroom Activity Book* (ISBN: 0-679-74684-6), *The Official Treehouse Activity Book* (ISBN: 0-679-74873-3), and *The Official Kid Pix Activity Book* (ISBN: 0-679-74685-4) are part of the Broderbund Family Computing Series. Each book gives parents (and children) 225 creative, educational ideas for using the programs. All from Random House, 800-733-3000.—*Charles Taft*

...And in Practice

BY CHARLES TAFT

Written *by* a teenager *for* teenagers, *Windows for Teens* pares Windows 3.1 down to the bare necessities required for teen computer survival.

Brittanney Trebnik, a 15-year old who also skates competitively, has given readers an entertaining, easy-to-follow introduction to Windows that includes cartoons and hints to help readers understand the operating environment.

After beginning with a crash course on general computer theory and mechanics, Trebnik zeros in on Windows terms, tools, and applications such as the Calculator and Windows Write. The author writes in "teen-speak" terms that use clever and humorous analogies to give clear examples and practical suggestions on how Windows can meet teen academic and personal needs.

Children yearning to become desktop publishers will find help in the pages of Kim and Sunny Baker's *The Create-It Kit.*

This clearly written, hands-on book comes with a software disk containing EnVision Publisher, a DOS-based desktop publishing program that's easy enough for a child to use yet powerful enough to create multicolumn newspapers.

EnVision contains the "standard" DTP drawing and text features, including a toolbar, pull-down menus, and font selection. Although children as young as seven can use the program, they may need some initial parental help in understanding the text and navigating the software.

The Create-It Kit is full of useful suggestions, and it has enough features to keep parents interested, too.

• **Windows for Teens,** *by Brittanney Trebnik, $14.95. Prima Publishing; 916-786-0426. ISBN: 1-55958-413-0.*

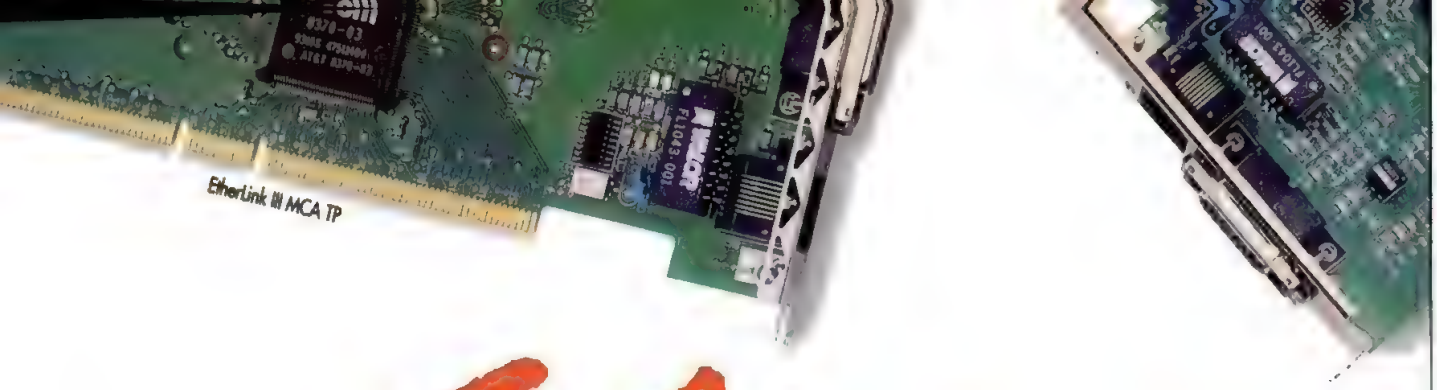
Circle 402 on reader service card.

• **The Create-It Kit: Desktop Publishing for Kids Age 7 and Up,** *by Kim and Sunny Baker, $25.00. Random House; 800-733-3000. ISBN: 679-74870-9.*

Circle 403 on reader service card.

Read Only Recommends

This is an entertaining photo scrapbook, well suited to any technophile's coffee table. *Defying Gravity: The Making of Newton*, by Markos Kounalakis and Doug Menuez. Beyond Words Publishing, $29.95. ISBN: 0-941831-94-9.



Unpar Tas

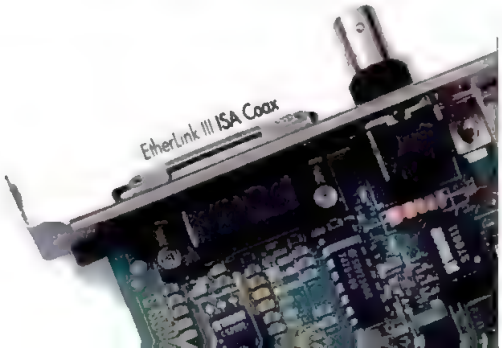
■ **What would you call a technology that delivers the fastest adapters in the world? That has won immediate acceptance from network managers around the world?**

Millions know it by the name Parallel Tasking.™ And you'll find it in only one place: The 3Com® family of EtherLink® III adapters.

With 3Com's Parallel Tasking adapters there is simply no faster way to run your network. And there is no other adapter line that offers more convenience and more performance at a lower price.

An EtherLink III Parallel Tasking adapter is SNMP-manageable. It is auto-configuring. And every 3Com EtherLink III adapter is backed by a lifetime warranty.

No wonder 3Com's Parallel Tasking adapters have



been heralded by *PC Week*, *PC Magazine*, and *InfoWorld* as the number one adapter for network managers today. And for the second consecutive year, LANQuest Labs® has declared the Parallel Tasking architecture to be the fastest adapter technology available.

It's no surprise, then, that more than two million have been sold.

But why not judge for yourself? For just $99, we'll send you an EtherLink III Benchmark Kit* that includes two EtherLink III combo adapters and a *Guide to Benchmarking Network Adapters* from LANQuest Labs. Just call **1-800-NET-3Com.**

It's never been easier to put unparalleled performance on your network.

3Com®

Networks That Go the Distance™

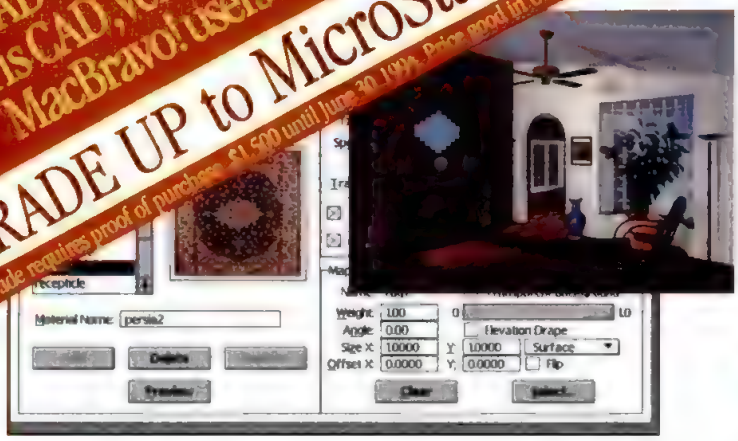
CIRCLE 110 ON READER SERVICE CARD

*Limit one to a customer while quantities last. ©1993 3Com Corp. (408) 764-5000. 3Com, Networks That Go the Distance, EtherLink, and Parallel Tasking are trademarks of 3Com Corporation. LANQuest Labs is a trademark of LANQuest Group. All other trademarks are property of their respective owners.

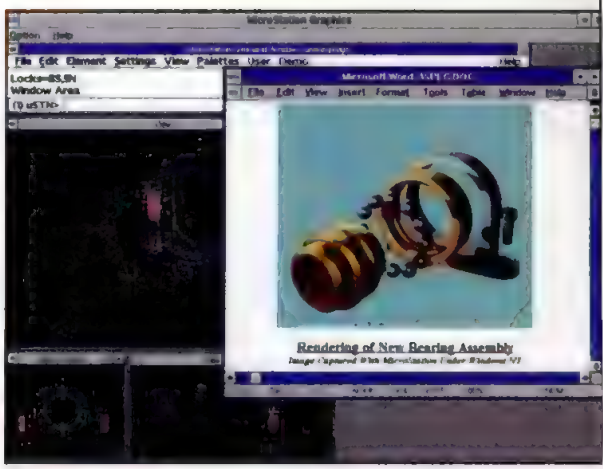
CADVANCE, Claris CAD, VersaCAD, MacBravo! users ...

TRADE UP to MicroStation

Trade requires proof of purchase. $1,500 until June 30, 1994. Price good in U.S. only.

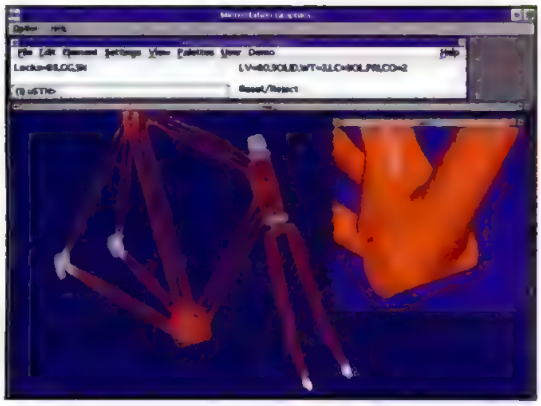


Rendering. *Visualization and flythroughs – at your fingertips! MicroStation offers photo-realistic rendering to every designer, right in the software. It's easy to make your image reflect your imagination.*



Windows. *It walks and talks Windows. Behind MicroStation lies the user-responsive programming you look for in good Windows software. Version 5 gives you the ultimate in integration of CAD, engineering, and business applications.*

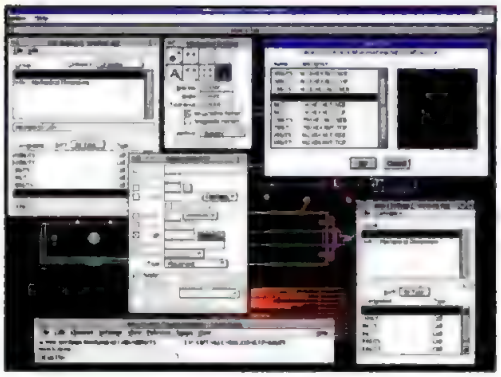
MORE POWER TO YOU.



Modeling. *Model any surface you can imagine in MicroStation. NURBS surface modeling combined with 3D Boolean operations gives you astounding flexibility in creating and modifying freeform models.*

Drafting. *MicroStation gives you first-rate drafting pow – without the limitations of old technology. Enjoy the advantage of contemporary features like as ciative patterning/batching, plot preview, standard text editing a fonts, and context-sensitive Hypertext help.*

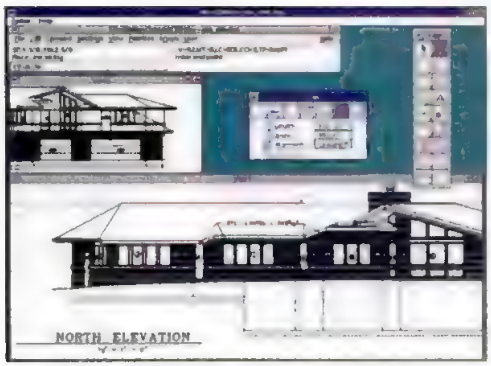
Read & write AutoCAD .dwg



Workspaces. *Choose the design environment that matches your profession or your CAD expertise – even AutoCAD. Complete with custom interfaces, drafting styles, and design environment management. CAD has never been so streamlined!*

O
mas
Mo
point

Intergraph® is a registered trademark of Intergraph Corporation. MicroStation® is a registered trademark of Bentley Systems Inc., an Intergraph affiliate. Other brands and product names are trademarks of their respective owners. Copyright 1993 Intergraph Corporation, Huntsville, AL 35894-0001 DDAD13™80



Usability. *What does computer-aided drafting have to do with the way you think? Everything. MicroStation software works for you. It understands the drafting process so well that it infers what you'll do next.*

Power. *Take your pick of popular environments: DOS, Mac, Windows, Windows NT, or UNIX. Have a look at MicroStation on Intergraph's Technical Desktop Series personal workstations.*

Graphical User Interface. MicroStation's easy-to-use interface includes pull-down menus, dialog boxes, tear-off tool palettes, and tool settings window. Choose your interface – Windows or Motif – on any platform. *Transparent Modeless Operation.* The software supports the way you naturally work, maintaining command execution while you fine tune: change element attributes or command parameters, manipulate views, change the dimensioning system, and more. *Powerful View Manipulation.* MicroStation supports up to eight active views that can be moved, sized, and overlapped to fit your design. Zoom and area at any scale. Move around your design fast with built-in dynamic panning. *Workspace Editor.* Tailor pull-down menus, dialog boxes, and tool palettes – even disable commands – with a graphically oriented toolset for customizing your chosen interface. *Text Capabilities.* A convenient text editor lets you easily edit single-line or paragraph text. Choose from TrueType, PostScript, AutoCAD SHX, and MicroStation fonts. ASCII text files can be imported and exported. *Multiple Undo/Redo Commands.* Undo mistakes and perform "what-if" designs in a flash with unlimited undo and redo. *Plotting.* Plot raster and vector information by view or defined areas, at any scale. Visually preview the plot before plotting, saving time and materials. *Online HELP.* MicroStation's HELP remains active, tracking the command you're currently using, so there's no searching through manuals for assistance. *Associative Patterning and Hatching.* Associate patterning with graphics. Change graphics and the patterning updates. Flood-fill hatching/patterning intelligently fills an area, detecting boundaries and holes with a single pick. *Associative Dimensioning.* Dimensions are associated with the geometry, not with a point in space, so that when you change the geometry, the dimensions automatically update. *Custom Line Styles.* Create space-saving custom line styles and place railroad tracks, trees, isobars – anything – just as you would place a line. *Multi-lines.* Define line string elements comprising up to 16 parallel lines of varying symbology and store them in a style library recall. Architects can use multi-lines for fast and easy placement and intersection cleanup of walls and partitions. *2D Boolean Ions.* Quickly modify, measure, and hatch multiple 2D shapes with integrated Boolean operations. *Mass Properties.* Calculate area and es of your model: surface area, volume, mass, centroid, moments and products of inertia, principal moments and directions, and radii of gyration. *S.* Define relationships among graphic entities with intuitive drawing modes such as tangent, parallel, perpendicular, midpoint, intersection, and end *nsion-driven Symbols.* Based on established relationships, you can assign variables to dimensioned graphics and save the graphics as c

MicroStation V5. CAD software that puts you in charge.

Call 800-345-4856 for a free brochure on MicroStation Version 5 and the name of an Intergraph representative in your area.

MicroStation
INTERGRAPH

CIRCLE 048 ON READER SERVICE CARD

A WORLD OF COMMUNICATION

THE LANGUAGE ASSISTANT SERIES™

FULL DOCUMENT TRANSLATION

The Best Translation Software for Windows and DOS - Guaranteed!

THE COMPLETE TRANSLATION SOLUTION

In today's global economy, the ability to communicate in other languages is invaluable. Whether you want to produce business and personal correspondence or improve your foreign-language skills, the Language Assistant Series makes it easy.

The Language Assistants translate documents from English to the foreign language, or vice versa. They produce understandable translations quickly and easily using sophisticated expert system technology. They're great for composing and translating letters, faxes, e-mail and other foreign-language documents.

POWERFUL REFERENCE TOOLS

A complete suite of reference tools gives you instant help when writing, studying, and translating. You get extensive grammar help, complete verb conjugations, and bilingual dictionaries. You can easily customize the dictionaries by adding new words and phrases, or by modifying existing entries.

The Windows version preserves WordPerfect, Microsoft Word for Windows, Lotus Ami Pro, and RTF formats, so you can quickly translate existing documents. The DOS version works with ASCII text files which can be easily generated by most word processors.

THE #1 CHOICE

The Language Assistant Series is the world's best-selling translation software with over 250,000 units sold. They're a great value at $99.95 each. And with a 90-day money-back guarantee, they're risk free. Order Now!

SEE YOUR SOFTWARE DEALER
OR CALL 1-800-366-4170

Spanish Assistant™ **German Assistant™**
French Assistant™ **Italian Assistant™**

CIRCLE 013 ON READER SERVICE CARD

MICROTAC SOFTWARE, INC.

4655 Cass Street, 2nd Floor • San Diego, CA 92109
(800) 366-4170 • (619) 272-5700 • Fax: (619) 272-9734

All product names are trademarks or registered trademarks of their respective owners.

Michael J. Miller

Conversations with My PC

Maybe we've all watched too many episodes of "Star Trek." We all expect that at some point we'll be able to talk to our computers, just as we talk to each other. They'll understand us, do what we want them to do, and talk back.

The reality is, of course, a long way from that final frontier. In the meantime, though, voice recognition is improving at a rapid pace. Handwriting recognition has gotten a lot more attention lately because of the proliferation of pen computers and personal digital assistants, but for many applications, voice recognition may be the most natural user interface of all.

CHOOSE YOUR FLAVOR

Voice recognition systems mostly come in two varieties: speaker-independent and speaker-dependent. Speaker-independent systems are designed to work with all sorts of users. They have relatively small vocabularies—perhaps less than a hundred words. Still, that's enough for many applications, such as telephone answering systems that can direct calls to specific people or departments by name.

In contrast, speaker-dependent systems require you to train the system to recognize how you pronounce various words and phrases. Typically, you do this by speaking a series of sentences to the system, which lets it understand more words more accurately. But the training process also makes getting started more difficult.

VOICES FOR EVERYONE

In the beginning, all of these technologies were relatively expensive and were designed for specific applications. But like most technologies, more powerful PCs and better software are beginning to bring better voice recognition to the mass market.

Lately, we've seen a number of very inexpensive solutions that offer basic voice recognition for controlling your applications. Essentially, you train these products to recognize the sound of your voice, and then you can simply say things like "save file" and "close application."

Among the products in this group are the Voice Pilot part of the Microsoft Windows Sound System, IBM's VoiceType Control for Windows, Creative Labs' Voice Assist, and the Covox Voice Blaster. All of these programs work with limited vocabularies of about a hundred commands or fewer, and either require or greatly benefit from user training. What makes them particularly attractive is that they work with inexpensive sound boards, such as the Creative Labs Sound Blaster and its compatibles, and sell for around $100.

I've tried several of these products lately, and I can see their uses. You can be across the room and tell your computer to do something and it will. It's a neat idea, and it certainly looks good in demonstrations.

HARDLY HEARING

In practice, of course, the results are somewhat mixed. The products do work, and they recognize what you say a surprisingly large percentage of the time. But in a way, people react to these voice recognition systems in much the same way as they did early optical character recognition (OCR) programs: You'll soon find yourself ignoring the 90 percent command recognition and instead focusing on the 10 percent of commands the system doesn't recognize, or, what's worse, on those it recognizes incorrectly. The vocabularies of all these systems are limited, they all get confused sometimes, and you can't expect them to work in a noisy office.

Voice recognition will understand you if you have patience and proper enunciation.

Still, voice recognition can come in handy in some situations: as an addition to the keyboard, or even as a replacement in situations where your hands are busy. (Also note that, for the same kinds of applications, there are more expensive

Illustration by Timothy Carroll

packages that combine software with special speech recognition boards to give your system a much larger vocabulary. One such example is Verbex Voice Systems' $495 Listen for Windows.)

Low-end voice recognition capabilities are also just starting to be built into computers. As is often the case in so many areas, Macintosh seems to be leading the way. Apple Computer's new AV systems, such as the Quadra 840AV, come with speech recognition built in. Since the 840AV also has speech synthesis, you can have the singular experience of talking to your computer and having it talk *back* to you. It's limited, but it sure is fun.

SMALL AND CHATTY

My guess is that you will see a lot more of this kind of inexpensive voice recognition in the coming few years, especially as more of the devices we use become simply too small to handle keyboards and as digital signal processors (DSPs) become more prevalent in all the computer systems we use.

Up to this point, we've primarily talked about inexpensive systems that recognize discrete words. There's also a growing market for other types of voice recognition technologies. Lately, we've begun to see a lot of activity in "continuous speech" technology, which is designed to understand the kind of speech we're most comfortable with—full sentences rather than short commands.

Today, these products are still rather expensive and are designed for specialized markets such as emergency medical situations in which the doctors' hands are usually otherwise occupied. Kurzweil Applied Intelligence is one company that's known for its work on such systems.

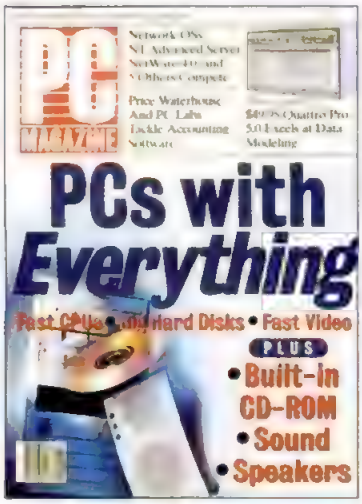
We're also seeing new activity in the development of voice-recognition systems designed for dictation. Typically, these systems have a fairly large vocabulary, measured in the tens of thousands of words, but require discrete speech—words spoken one at a time. In these solutions, the system tries to figure out which word you want (such as *to, two,* or *too*), but if it guesses wrong, you can manually correct it.

This kind of speech recognition shows signs of becoming much more widely available. For instance, IBM's new Personal Dictation System has a list price of $499. Unfortunately, that doesn't include the additional $499 for an ISA half-card that is required by the system, nor the up to $599 more for any one of the system's specific vocabulary models designed for journalists, emergency medical practitioners, or radiologists.

REALITY CHECK

All of these products have come a long way in the past few years and will undoubtedly get even better. But it will be a long time before these systems work as well as the ones in science fiction. And of course, there is always the requisite cautionary tale.

I had two of these systems set up in my office one day, and I forgot to shut off the recognition. Both the Macintosh and the PC were running, and the PC started picking up the voice from the Mac, and the Mac started interpreting noise from inside the room, from the PC, and from the crowd of editors outside my door. Both machines were doing things I didn't want them to. I was reminded of the line from *2001: A Space Odyssey,* a movie featuring a computer that was really good at voice recognition: "Open the pod bay doors, HAL!" □



ONE YEAR
22 issues for $29.97.
YOU SAVE 54%!

TWO YEARS
44 issues for $49.97.
YOU SAVE 62%!

Call toll-free today:
1-800-289-0429

INSIDER'S PRICE

FOR OUR READERS — SUBSCRIBE & SAVE

Plus a Bonus! 3 Disks with 146 utilities FREE with your paid order.

ANNUAL COVER PRICE	REGULAR SUBSCRIPTION PRICE	YOUR PROFESSIONAL RATE	BONUS STATUS
~~$64.90~~	~~$44.97~~	$29.97	3 FREE DISKS

Subscribe now, and get 22 issues for only $29.97 — that's 54% off the annual cover price! Better yet, sign up for two years and get 44 issues for just $49.97 — a savings of 62%!

Along with your order you'll also get PC Magazine's **"Utilities Library"** on 3 disks — **FREE** with your paid subscription! These 146 DOS and Windows™ utilities, selected especially for new subscribers by PC Magazine's editors, let you upgrade your system, boost your PC power, and simplify tasks — all at the touch of a key! This exclusive software is available only to new subscribers!

Canada and foreign add $36.00 per year. U.S. funds only. Canadian GST included. Please allow 30 days for shipment of first issue. FREE disks will be sent upon payment.

The Real Power Behind Many PCs Will Surprise You.

ACER COMPUTERS • THE INDUSTRY SOURCE •

Buy Direct From The Industry Source.

Acer makes the PCs sold by the world's leading computer companies.

Join The Pentium™ Revolution With The AcerPower 9000.

Make the next technological move up with the impressive Pentium-based AcerPower 9000. Unmatched 64-bit processing speed and massive expansion capability add up to a system that will serve you for years to come—at a price you can afford now.

AcerPower 9000

- Intel® Pentium 60MHz CPU
- 16MB System RAM
- 512KB Second-level Cache
- SCSI Chip on Motherboard
- 520MB SCSI Hard Disk Drive
- Sony® SCSI CD-ROM Drive
- 1.44MB Floppy Disk Drive
- Diamond Viper™ VESA Graphics Accelerator
- 15" SVGA .28 Non-interlaced Color Monitor
- Microsoft® Windows™ 3.1, MS-DOS® 6
- 8 32-bit Expansion Slots, 6 EISA, 2 VESA

$4,995

ACER COMPUTERS • THE INDUSTRY SOURCE •

The $1.5 Billion Giant You Can Rely On.

Since our start in 1976, Acer has grown to be the vendor of choice for the world's top computer companies. Some of the biggest names in the industry recognize Acer as one of the world's most quality-conscious PC manufacturers. Our attention to detail, excellent record of reliability and great value have helped us to achieve status as the world's leading OEM manufacturer. Now you can buy direct from the industry source.

BYTE AWARD OF DISTINCTION — Received by the AcerPAC Multimedia System for excellent features and design.

The symbol of quality that only a select few can claim.

PC WORLD — Received by the AcerPower 486o and notebook for the right combination of performance, price, expandability and design.

ISO 9000—The Ultimate In Quality.

Acer products have some of the highest out-of-box reliability and up-time rates in the industry, which means you can always count on your PC. As one of the few multi-national companies in the U.S. to offer a complete family of computer products built entirely in ISO 9000-certified facilities, you get quality and excellence in every Acer product you buy.

You Get Innovative Technology First.

The first MIPS-based PC. The first symmetric multiprocessing PC. The first PC with dual-Pentium™ single-chip upgrade capability. This is just a sampling of the innovative technology firsts that Acer has achieved in 17 years of building unique computing solutions.

VESA Local Bus Built For Speed.

Acer desktop PCs give you more than 16 times the speed of ISA with VESA local bus. VL bus connects peripherals directly to the CPU where 32 bits of data can be passed along at incredible speeds providing the perfect solution for demanding applications like full-motion video and multitasking.

Easy Upgrades With ChipUp.™

Because we're committed to engineering leading-edge features into everything we make, you can rest assured that every product you purchase from Acer won't be outdated before you get it out of the box. Our unique ChipUp technology allows users to upgrade their systems to the full family of Intel processors, including the DX/50, DX2/66 and even the next generation Intel Pentium Upgrade Processor.

intel inside

Popular software like Microsoft Works for Windows and Productivity Pack comes preloaded on select Acer systems.

Now you can buy Acer direct.

Also available through our fine resellers and retailers.

VISA MasterCard LEASING

AcerPower 486DX2/66T

- Intel 486DX2/66MHz CPU
- 16MB System RAM (expandable to 64MB)
- 256KB Second-level Cache
- 340MB Hard Disk Drive and **2X CD-ROM Drive**
- 1.44MB Floppy Disk Drive
- VL Bus Accelerated VGA with 1MB DRAM-ATI
- 15" SVGA .28 Non-interlaced Color Monitor
- Upgradable to Intel Pentium Upgrade Processor
- Microsoft Works for Windows, Productivity/ Entertainment Packs and Quicken® Installed
- 8 16-bit ISA Slots, 2 on VESA Bus

The Power House

$2,995

AcerPower 486DX2/66

- Intel 486DX2/66MHz CPU
- 8MB System RAM (expandable to 64MB)
- 128KB Second-level Cache
- 340MB Hard Disk Drive
- Dual Floppy Disk Drives
- VL Bus Accelerated VGA with 1MB DRAM-S3
- 15" SVGA .28 Non-interlaced Color Monitor
- Upgradable to Intel Pentium Upgrade Processor
- Microsoft Works for Windows, Productivity/ Entertainment Packs and Quicken Installed
- 8 16-bit ISA Slots, 2 on VESA Bus

PC WORLD BEST BUY

$2,395

AcerPower 486DX2/50

- Intel 486DX2/50MHz CPU
- 8MB System RAM (expandable to 64MB)
- 128KB Second-level Cache
- 340MB Hard Disk Drive
- Dual Floppy Disk Drives
- VL Bus Accelerated VGA with 1MB DRAM-S3
- 15" .28 Non-interlaced Color Monitor
- Upgradable to Intel Pentium Upgrade Processor
- Microsoft Works for Windows, Productivity/ Entertainment Packs and Quicken Installed
- 8 16-bit ISA Slots, 2 on VESA Bus

The Graphics Blaster

$2,195

Acer ACROS 486DX2/50

- Intel 486DX2/50MHz CPU
- 4MB System RAM (expandable to 36MB)
- 340MB Hard Disk Drive
- Dual Floppy Disk Drives
- 1MB VESA Cirrus Logic™ Graphics Accelerator
- 14" .28 Non-interlaced SVGA Color Monitor
- Upgradable to Intel Pentium Upgrade Processor
- Microsoft Works for Windows, Productivity/ Entertainment Packs and Quicken Installed
- 4 16-bit ISA Slots, 2 on VESA Bus
- **128KB Cache Upgrade.....$35**

The Perfect Windows Workstation

$1,795

Acer ACROS 486SX/33

- Intel 486SX/33MHz CPU
- 4MB System RAM (expandable to 36MB)
- 240MB Hard Disk Drive
- 1.44MB Floppy Disk Drive
- 1MB VESA Cirrus Logic Graphics Accelerator
- 14" .28 Non-interlaced SVGA Color Monitor
- Upgradable to Intel Pentium Upgrade Processor
- 9600 Baud Fax Modem
- Microsoft Works for Windows, Productivity/Entertainment Packs, Quicken and Prodigy® Installed
- 4 16-bit ISA Slots
- **128KB Cache Upgrade.....$35**

Excellent Price/ Performance

$1,395

Call 800-848-ACER

When calling, please reference #014 ACD

Monday through Friday 6 AM-6 PM and Saturday 8 AM-4 PM Pacific Time

Upgrade Your Monitor

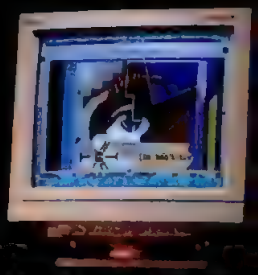
For just a little extra money you can see a lot more. Take advantage of our monitor upgrade program and you can get a 15" low radiation color monitor with 1024 x 768 resolution for only $99 more. And $549 more will get you a full-featured 17" color monitor with on-screen adjustment capabilities and 1280 x 1024 resolution. After all, don't you deserve it?

$99 Additional

AcerView™ 56L 15" Color Monitor

- 15" Non-glare Flat Square Screen
- Low Radiation CRT
- Superfine 0.28mm Dot Pitch
- 1024 x 768 Resolution, NI
- Intelligent Micro-control System
- Ergonomic Tilt/Swivel Base

$549 Additional



AcerView 76i 17" Color Monitor

- 17" Non-glare Flat Screen
- Superfine 0.28mm Dot Pitch
- iColor System for Color Adjustments
- Intelligent iScreen Menus
- Automatic Display Mode Switching
- 16 User-programmable Display Modes
- VGA, SVGA, XGA, VESA, and CAD/CAM Compatible
- VLMF Low Radiation Feature

Call for prices to purchase monitors separately.

Acer

Only the Acer product line spans all your computing needs.

Make It A Multimedia Holiday!

'Tis the season for giving—and the exciting Acer Multimedia System is a great choice for anyone on your list. There's nothing like the interactive combination of audio and video to bring information to life.

Acer Multimedia System

- Intel 486SX/33MHz
- 4MB System RAM (expandable to 36MB)
- 128KB Second-level Cache
- 240MB Hard Disk Drive and 2X CD-ROM Drive
- 1.44MB Floppy Disk Drive
- 1MB VESA Cirrus Logic Graphics Accelerator
- 16-bit Sound Card
- Two External Speakers
- 14" SVGA .28 Non-interlaced Color Monitor
- Microsoft Works™ for Windows™ Multimedia Edition, Encarta,™ Golf,™ Cinemania™ and SoundBits™ Installed
- 4 16-bit ISA Slots

Holiday Special $1,795

Exclusive Microsoft Multimedia Software.

Learning is a never-ending world of discovery for students and adults with this powerful bundle of Microsoft educational and entertainment multimedia software... the funny thing is, it's hard to tell the two apart! Microsoft Works for Windows Multimedia Edition features an on-line tutorial that will have you using word processing, charts, spreadsheets and graphics like a pro. Encarta sets a new standard for electronic encyclopedias that is unmatched in breadth and depth. Golf gets you on the course no matter how windy it is outside. Cinemania and SoundBits bring fabulous movie and cartoon audio and images to your PC!

Notebooks Made With You In Mind.

We've designed our notebooks with your comfort in mind. The ergonomic palmrest with integrated EasyTrac™ trackball is exceptionally easy to use and reduces wrist strain during long periods of typing. The 82-key keyboard has a logical layout with separate PgUp, PgDn, Home and End Keys and a comfortable tactile feel.

High Performance Priced Right.

Acer recognizes that what you want in a computer is leading technology and lasting performance at a reasonable price. That's why we have more than 500 engineers dedicated to developing new, innovative technologies that are introduced in high-quality, reliable products. And our strong alliances with companies like Novell, Microsoft and SCO give us the ability to support new products like Windows NT as soon as they hit the market. So whether you need a powerful notebook or a high-performance server, count on Acer to give you what you need at a price you can afford.

yes NetWare.

intel inside

ACER COMPUTERS • THE INDUSTRY SOURCE •

Now you can

Also available through our fine resellers and retailers.

VISA MasterCard LEASING

AcerPower 486DX2/66e

- Intel 486DX2/66MHz CPU
- 8MB System RAM (expandable to 64MB)
- 128KB Second-level Cache
- 340MB IDE Hard Disk Drive
- Dual Floppy Disk Drives
- SVGA Graphics Adapter
- 15" SVGA .28 Flat Screen Monitor
- Microsoft Windows 3.1, MS-DOS 6
- 7 Expansion Slots, 2 ISA, 5 EISA
- Upgradable to Intel Pentium Upgrade Processor
- **Super EISA Performance**

PC WORLD BEST

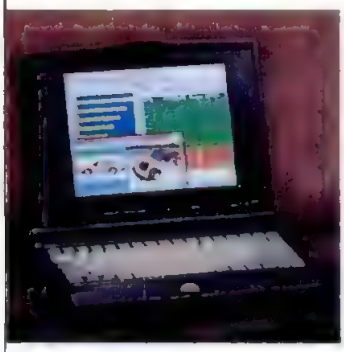
$2,795

AcerPower 486DX2/66T

- Intel 486DX2/66MHz CPU
- 8MB System RAM (expandable to 64MB)
- 256KB Second-level Cache
- 340MB-SCSI Hard Disk Drive
- Dual Floppy Disk Drives
- Local Bus Accelerated VGA with 1MB
- Upgradable to Intel Pentium Upgrade Processor
- 14" SVGA .28 Non-interlaced Color Monitor
- Microsoft Works for Windows, Productivity/ Entertainment Packs and Quicken Installed
- 6 16-bit ISA Slots, 2 on VESA Bus

Powerful Space-saving Mini-tower

$2,395

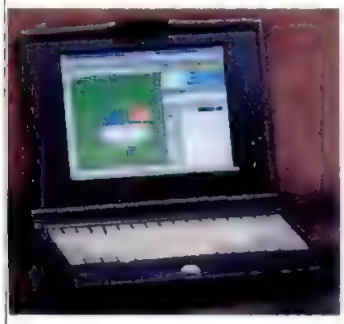


AcerNote 750c 486SL/25

- Intel 486SL/25MHz CPU
- 4MB System RAM
- 2 PCMCIA Type II Slots/1 Type III Slot
- 9.5" Active-matrix Color Display
- 120MB Hard Disk Drive
- Palmrest with Integrated Trackball
- SmartCase™ Modular Housing
- MS-DOS 6, Microsoft Windows 3.1 and Works for Windows Installed
- International Travelers Warranty
- **Monochrome Price.....$1,999**

Active-Matrix Color Display

$3,695



AcerNote 730c 486SX/25

- Intel SL-Enhanced 486SX/25MHz CPU
- 4MB System RAM
- 9.5" Dual-scan Passive-matrix Color Display
- 120MB Hard Disk Drive
- Palmrest with Integrated Trackball
- SmartCase Modular Housing
- Fax Modem and Software
- MS-DOS 6, Microsoft Windows 3.1 and Works for Windows and Prodigy Installed
- International Travelers Warranty
- **Monochrome Price.....$1,799**

Affordable Color Notebook

$2,445

You Deserve Special Treatment.

Join the Preferred Corporate Buyer Program and you'll get preferential treatment—such as a dedicated account representative with a special 800 ordering number, your own service and support hotline, replacement parts in 48-hours and special lease rates.

buy Acer direct.

Call 800-848-ACER

When calling, please reference #014 ACD

Monday through Friday 6 AM-6 PM and Saturday 8 AM-4 PM Pacific Time

Talk to a Helpful Engineer 7 Days A Week/24 Hours A Day

Have a question about how to set up your system? Want to know how to get going on Microsoft Works for Windows? Curious about what options are available with your system? Just call us toll-free, any time of day, any day of the week and our trained professionals will be happy to help.

A Full Year Of On-Site Service

Don't worry. If you have a problem with your Acer desktop system, we'll have a service representative out to you in 48 hours—we promise.

Express Parts Replacement

Because time is money, we will get replacement parts out in less than 72 hours.

Assistance Around The Globe

When you take your Acer notebook on the road, you take first-class service and support with you. Every AcerNote computer comes with a one-year International Travelers Warranty, which gives you support in more than twenty countries worldwide.

WARRANTY

30-Day Money-Back Guarantee

We are so sure that you'll be totally satisfied with your new Acer system that we're offering a full 30-day money-back guarantee—no questions asked.

Acer America Corporation
2641 Orchard Parkway
San Jose, CA 95134
Fax: 408-922-2953

*Please call 1-800-848-ACER for details on the money-back guarantee, limited warranty and International Travelers Warranty. Return shipping and insurance charges are the responsibility of the customer. Not available in Canada. On-site service may not be available in certain remote locations. Products, availability, prices and programs are subject to change or cancellation without notice. Shipping and handling charges are extra. Acer and the Acer logo are registered trademarks and AcerNote, AcerView, ChipUp and SmartCase are trademarks of Acer America Corporation and Acer, Inc. Intel and the Intel Inside Logo are registered trademarks of Intel Corporation. All other brands and product names are trademarks or registered trademarks of their respective companies. ©1993 Acer America Corporation. All rights reserved.

CIRCLE 034 ON READER SERVICE CARD

WATCH WHAT YOU SAY.

Introducing the Pro AudioStudio 16 with voice recognition. From the world leader in 16-bit sound.

Your computer is listening. And responding. Because now, Media Vision is delivering the world's most advanced 16-bit sound solution — with voice recognition — for your PC. It's the Pro AudioStudio™ 16. Providing the CD-quality, 16-bit digital audio that has earned Media Vision PC Magazine's Editors' Choice Award for best PC Sound. And a whole lot more.

Pro AudioStudio 16 comes complete with the Pro AudioSpectrum™ 16 sound card, a microphone and Windows™ compatible software, including sound editor, 16-bit text to speech synthesizer, mixer and audio compression and decompression. And QuickStart® installation software makes Pro AudioStudio 16 easy to set up. Plus, it's 100% compatible with MPC, MPC2, AdLib™ and SoundBlaster™ cards.

You can be sure you're getting the best. Because it's from Media Vision, the most trusted name in 16-bit sound. In fact, more major PC manufacturers use Media Vision than any other sound solution.

So if your reasoning is sound, voice your preference for Pro AudioStudio 16. It'll change your vision of 16-bit sound.

PC MAGAZINE EDITORS' CHOICE

PC Multimedia PC

PC2 Multimedia PC

MICROSOFT WINDOWS COMPATIBLE

MEDIA VISION

Call 1-800-845-5870 for information or a dealer near you. ©1993 Media Vision, Inc., 3185 Laurelview Court, Fremont, CA 94538. (510) 770-8600. Fax: (510) 770-9592.
Pro AudioStudio and Pro AudioSpectrum are trademarks of Media Vision, Inc. All other trademarks are owned by their respective companies.
CIRCLE 337 ON READER SERVICE CARD

Bill Machrone

Chipping Away at Intel?

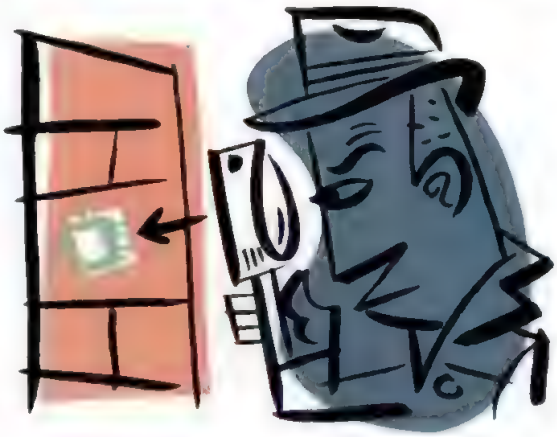
The future of the computer industry is a continuing source of delight and despair as we try to keep up with the ever-evolving state of the art. Desktop performance is on the edge of another dizzying upward spiral, and Pentium is only the beginning. Already, system prices are below $3,000. For a $500 premium, you can have performance 80 percent faster than a DX2/66. Not content to rest on its laurels, Intel is hard at work on Pentium's successors, the P-6 and P-7 (Sexium? Septium?). Everyone else is hard at work on getting a piece of Intel's market share. There are two ways to do it, and neither of them is easy. One way is to clone the Intel instruction set and build compatible processors. This is the route chosen by AMD, Cyrix, and lately, Texas Instruments. The other way is to build a software bridge to fast RISC microprocessors. The Digital Alpha AXP, the MIPS R-4400, the IBM/Motorola PowerPC, and even the Sun SPARC are all courting high-end users with portable operating systems and software emulators.

The Intel-compatible crowd have a tough row to hoe; they're always either suing or being sued by Intel. When they're not in court, they're thinking up ways to make Intel-equivalent chips that operate on less power or deliver more performance for the dollar. AMD and Cyrix have been particularly adept at exploiting gaps within the Intel product lineup, with chips such as the 386DX/40, higher-performance replacements of the 386SX, and parts that can legitimately be called 486. IBM has exploited its cross licenses with Intel to produce supersets of the 486 that have more cache and clock-tripling instead of clock-doubling speed.

BIGGER THAN INTEL

AMD's, IBM's, and Cyrix's efforts, along with the expansion of size of the installed base, have caused the 486 standard to essentially pass out of Intel's hands. As long as the processor is compatible with Intel's 486 core logic, vendors are free to enhance it in new and creative ways. As long as applications and operating systems run as they would on genuine Intel, who cares what else is going on inside?

The most interesting of the supersets is Cyrix's M1 technology. Cyrix emphasizes that it's a technology, not a product. Where have we heard this one before? Remember when NT was a technology, not a product? M1 embodies innovative extensions to 486 architecture and, unlike Pentium, doesn't require recompilation to be maximally effective. Intel opened a Pandora's box when it turned to compiler vendors for getting the most out of Pentium architecture. Once you open the door to recompilation, you're inviting the vendors to recompile for any chip, not just the Pentium. Intel may be getting us used to the recompiling for future generations of processors, but this strategy could ultimately backfire on Intel. What if the vendor recompiles for PowerPC instead of Sexium? Also, even the recompiled software with Pentium optimizations still runs on older 486 and 386 chips, and most Pentium optimizations are universal, so other vendors benefit as much as Intel from the new compiler technology. A few of the optimizations, such as register allocation and instruction ordering to use pipeline stages more efficiently, are specific to the Pentium, but they don't prevent the code from executing on other 486 logic cores.



The future of microprocessors is there for you to see—if you have an electron microscope.

Cyrix believes that it can make a stronger argument than Intel for performance within the definition of a 486. M1 technology is invisible to the software. For instance, a modern, superscalar processor overlaps several different instructions at a time. Envision a factory with a door at one end for receiving raw material and another at the other end for storing the completed product. The Pentium has dual instruction units, which act like two assembly

Illustration by Timothy Carroll

GET NONSTOP SYSTEMS INFORMATION...

AND 3 DISKS – FREE!

Don't miss a single product report or productivity-enhancing tip — subscribe to PC Magazine today. You'll get 22 issues for only $29.97 — that's 54% off the $64.90 cover price! Better yet, sign up for two years and get 44 issues for just $49.97 — a savings of 62%!

Order now and you'll also get **PC Magazine's *"Utilities Disk Library"* on 3 disks — FREE** with your paid subscription. These 103 utilities, selected especially for new subscribers by PC Magazine's editors, let you up-grade your system, boost your PC power, and simplify tasks — all at the touch of a key. This exclusive software is available *only* to new subscribers!

ONE YEAR
(22 issues) for $29.97.
YOU SAVE 54%!

TWO YEARS
(44 issues) for $49.97.
YOU SAVE 62%!

Call toll-free today:
1-800-289-0429

Basic one-year subscription $44.97; on newsstands $64.90. Canada and foreign add $32.00 per year. U.S. funds only. Canadian GST included. Please allow 30 days for shipment of first issue. FREE disks will be sent upon payment.

lines inside the factory. When an operation is completed, it needs to pass the result down to the next station on the line. If that station is occupied, then the line backs up. In the M1 design, however, the processor completes the operation anyway and places the result in a temporary storage bin that "looks" like the next station of the assembly line. Then when the actual bin is empty, M1 switches the result from the temporary storage bin into the proper register so that the result can be moved to the next station on the assembly line.

Pentium has dual instruction units and branch prediction, meaning that it takes a guess about whether a program instruction will branch. If it's right, you get a speed boost. If it's wrong, you're no worse off than you would have been if it hadn't guessed. M1 takes this nothing-ventured-nothing-gained attitude a step further with speculative execution. Not only does it guess what your program will do next, but the second instruction unit starts executing the program. By gambling to win, M1 saves clock cycles and executes programs faster. These are fresh ideas and are well beyond mere cloning. Look for products embodying M1 technology in the second half of the year.

BROILER OVEN

Chip vendors are also gambling that you'll want multiprocessing on your desktop within the next year or so. Don't burn your hand on a Pentium, they argue; just add more 486s. This is a risky bet because it assumes acceptance of a multiprocessing operating system such as Windows NT or the MP version of OS/2. Cache snooping is already part of the 486 design, and it is necessary for multiprocessor operating systems so that they can synchronize the activities of the chips. AMD, for one, will introduce devices that add write-back control and significantly larger caches for greater performance in a multiprocessing system.

Intel won't ignore this market; in fact, it has the inside track. Most 486 machines have a socket for an Overdrive processor, and Intel has two products aimed at it. One, coded the P24T, is a clock tripler and may have been officially announced by the time you read this. The other, the P54C, uses a Pentium logic core and is widely believed to enable coprocessing with the 486 chip that's already in your machine. □

YOU KNOW HOW SOME THINGS ALWAYS LOOK GOOD FROM A DISTANCE?

MAYBE YOU'D BET LOOK AT MICROSOF

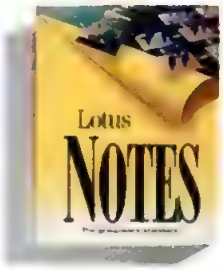
As anyone who's ever been in the desert can tell you, things aren't always as they appear. Whether it's an oasis in the sand. Or a suite of application software in the office.

Unless you look very closely, for example, you'd swear Microsoft® Office was a revolutionary new way to use, manipulate and share business data through integrated software. When, in reality, Lotus® SmartSuite® achieved that distinction over a year ago.

A closer inspection will also demonstrate that not all of Microsoft Office's five applications are designed for general business users. And some new versions aren't yet available at all. Lotus SmartSuite, on the other hand, has five of the leading award-winning, most usable applications. All of which truly complete the desktop of every Windows™ user.

LOTUS SMARTSUITE 2.1 VS.	MICROSOFT OFFICE PRO
APPLICATIONS	
1-2-3® RELEASE 4 AMI PRO® 3.01 FREELANCE GRAPHICS® 2 01 APPROACH® 2.1 ORGANIZER™ 2.1	EXCEL 5.0 WHEN AVAILABLE WORD 6.0 POWERPOINT® 4.0 WHEN AVAILABLE ACCESS™ COUPON FOR 1 SEAT OF MICROSOFT MAIL
INTEGRATION	
LOTUS APPLICATION MANAGER COLLECT & COPY DDE, OLE CONSISTENT USER INTERFACE	MICROSOFT OFFICE MANAGER DDE, OLE (2.0 IN WORD) SEMI-CONSISTENT USER INTERFACE
WORKGROUP	
ALL APPS MAIL-ENABLED VERSION MANAGER™ INTEGRATED WITH NOTES® THRU NOTES/FX™	ALL APPS MAIL-ENABLED SCENARIO MANAGER
VALUE	
$299 COMPETITIVE UPGRADE	$348 COMPETITIVE UPGRADE

And while Microsoft claims Office is going to fully maximize cross-product integration and consistency, Lotus is already way down the road to achieving precisely that across all five applications. Sharing the same user interface. With common menus. And SmartIcons.® To say nothing of task-oriented functions that cross applications. Collect and Copy for instance. With a single click, it lets users gather data from 1-2-3® and Freelance Graphics® and combine it into an Ami Pro® word processing document.



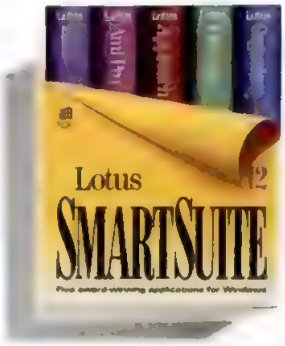
SmartSuite and Lotus Notes. The secret to integrating workgroups instead of just applications.

Of course, you might be just as easily deluded

*In Canada call **1-800-GO-LOTUS**. **$299 direct from Lotus. Offer expires 1/31/94 or while supplies last. Qualifying competitive products are Microsoft Excel, Borland® Quattro® Pro (excluding Quattro Pro SE and Qualifying Lotus products include 1-2-3 (excluding 1-2-3 for Home), Symphony® Ami Pro, Freelance Graphics, Approach and Graphwriter.® ©1993 Lotus Development Corporation, 55 Cambridge Parkway, Cambridge, MA. Manager and Notes/FX are trademarks of Lotus Development Corporation. Microsoft and PowerPoint are registered trademarks and Windows and Microsoft Access are trademarks of Microsoft Corporation. Borland, DisplayWrite is a registered trademark of International Business Machines Corporation. Harvard Graphics is a

TER TAKE A CLOSER
T OFFICE AFTER ALL.

into believing that Microsoft Office is workgroup enabled. When, in fact, Office can only integrate applications, SmartSuite can actually integrate entire groups of people. With Lotus Notes® groupware, SmartSuite users can access, share, track and manage business data like never before. Not only can it be routed, it can be revised, stored and accessed concurrently by multiple users working in collaboration.



And right now, you can upgrade from any Lotus or competitive product to SmartSuite 2.1 for just $299.** Just visit your Lotus Reseller. Or call Lotus for a demo disk at **1-800-TRADE-UP, ext. 9372.*** We can assure you, this is one time you really will be able to believe your eyes.

Lotus
Working Together®

Quattro Pro 5.0, Microsoft Word, WordPerfect,® Wordstar,® DisplayWrite® PowerPoint, Harvard Graphics® Corel Draw, WordPerfect Presentation, Aldus® Persuasion, dBase® Paradox,® Access, SuperBase and Filemaker 02142. All rights reserved. Lotus, SmartSuite, SmartIcons, Ami Pro, 1-2-3, Freelance Graphics, Lotus Notes, Approach, Symphony, Graphwriter and Working Together are registered trademarks and Lotus Organizer Version Quattro, dBase and Paradox are registered trademarks of Borland International, Inc. WordPerfect is a registered trademark of WordPerfect Corporation. Wordstar is a registered trademark of Wordstar International, Inc. registered trademark of Software Publishing Corporation. Aldus is a registered trademark of Aldus Corporation.

Music To Your Eyes.

The ZEOS® ColorNote™... scaling new heights.

STANDARD WITH EVERY ZEOS COLORNOTE 486

- 33MHz 486SX Intel processor.
- RAM expandable to 20MB.
- IDE hard drive expandable to 170MB.
- 8K internal cache.
- Internal 3.5" 1.44MB floppy disk drive.
- PCMCIA slot supporting a type I, II or III device.
- 512K video RAM.
- Local bus video for super-fast video performance.
- Display: 640 x 480 dual scan color VGA backlit LCD, 9.4" diagonal, up to 256 colors.
- Supports an external SVGA color monitor at resolutions up to 1024 x 768.
- 82-key keyboard with embedded numeric keypad and 12 dedicated function keys.
- Built-in trackball.
- Replaceable and rechargeable NiMH battery.
- One serial port, parallel port, keyboard port, mouse port and external video port.
- Full power management features include Low Power mode and programmable Stand-by features.
- AC adapter from AC110-240V to DC.
- 8.54" x 11.65" x 1.5"; 5.6 lbs.
- FCC Certified Class B; UL Listed.
- Complete ZEOS Customer Satisfaction Package.

PACKAGE 1

ColorNote 486: $2395
Lease $87/month
- 4MB RAM
- 80MB IDE hard drive

PACKAGE 2

ColorNote 486: $2695
Lease $97/month
- 4MB RAM
- 120MB IDE hard drive
- Microsoft DOS 6.2
- Microsoft Windows for Workgroups 3.11
- Lotus Organizer

PACKAGE 3

ColorNote 486: $2995
Lease $108/month
- 8MB RAM
- 170MB IDE hard drive
- Custom leather carrying case
- Microsoft DOS 6.2
- Microsoft Windows for Workgroups 3.11
- Lotus Organizer

With color and power you can't beat, the ZEOS ColorNote 486 is the only color notebook worth taking note!

We started with a reliable 486SX Intel processor running at 33MHz with 8K built-in cache. Then we loaded it with enough memory and power to run Windows: 4MB or 8MB RAM (expandable to 20MB), an 80MB, 120MB or 170MB IDE hard drive. And, we added local bus video for super-fast video performance.

Blazing colors seem to sing. Images are vibrant and alive. For a crisp VGA backlit screen displaying up to 256 colors, the ColorNote employs dual scan technology – a breakthrough that achieves color comparable to that of a desktop color monitor yet is not as expensive as active matrix.

What's more, it comes equipped with a PCMCIA slot, an internal floppy drive, built-in trackball and a Nickel-Metal Hydride battery. If your needs go beyond the standard scale, you can compose a personalized package with our many options. Let the ColorNote be the basis for your creative scores and presentations.

ZEOS dual scan screen (left) fires up rich, vibrant colors while standard passive matrix screen (right) produces faded and dull colors. Photos are not retouched.

intel inside

AWARD-WINNING SERVICE

We're the only company to win *PC Magazine*'s Readers' Choice for Service & Reliability–for both desktops and notebooks–*twice!*

We're here for you 24 hours a day, 365 days a year, and always a toll-free call away. All ZEOS systems come with a One Year Limited Warranty and 30-Day Money-Back Guarantee.

CALL NOW TOLL FREE
800-554-7172

Fax Orders: 612-633-1325, Government: 800-245-2449, Hearing Impaired (TDD): 800-228-5389, Outside U.S. and Canada: 612-633-6131. Purchase Orders, MasterCard, VISA, Discover, Am Ex, Z-Card,™ COD and affordable leasing programs. Open 24 Hours a Day, 365 Days a Year!

ZEOS INTERNATIONAL LTD

Purchase orders are subject to approval. Business leasing programs available. Lease prices based on a 36-month lease, 10% purchase option. All prices, specifications and availability are subject to change without notice; call to confirm these and warranty details. Prices do not include shipping. All products and company names are trademarks or registered trademarks of their respective holders. ZEOS is a registered trademark; Z-Card and Computers New! are registered servicemarks; ColorNote is a trademark of ZEOS International Ltd. ©1993 ZEOS International Ltd., 1301 Industrial Blvd., Minneapolis, MN 55413 USA. ZEOS is a publicly traded company (NASDAQ symbol: ZEOS).
CLR-PCM-9403B

CIRCLE 063 ON READER SERVICE CARD

John C. Dvorak

SOHO? Ho Ho!

I just got the latest Flight Simulator from Microsoft, and emblazoned on the box is the new "Microsoft Home" logo. Microsoft, looking for new frontiers just like everyone else, is targeting the laughable and possibly already saturated small office/home office market, also known as *SOHO*. You'll even see SOHO magazines soon, along with all sorts of assumptions about this not-so-new market. Yes, friends, I'm a big skeptic on this one. I think the SOHO dream is going to be a repeat of the fabled PC*jr* fiasco of years ago, in which every research company and many a software firm envisioned a pot of gold in the home computer scene.

Before I go into my tirade, let me just say that I detest the term *SOHO*. What's wrong with just "Small Office" or "Home Office"? And how did these two distinct markets get jumbled into one?

Anyway, I hate to break it to these marketing geniuses, but this market has been with us since the invention of the Altair computer in 1975, and it was boosted to the forefront by the Apple II. The driving forces behind the SOHO market have always been the early adopters of technology and the power users.

The SOHO computer buyer is, typically, a *PC Magazine* reader who probably has computers at home, at the office, and on the road. In fact, today's power user is more likely to have a power machine at home than at the office. A power user spending his or her own money tends to buy a lot of computer for the buck and one that lasts a long time. This means the fastest, most powerful machine around.

There's a mistaken belief that the SOHO market represents the low end of the PC market. This is the same assumption made by the PC*jr* prognosticators. The PC*jr* was going to be the be-all, end-all SOHO machine (before the idiotic term *SOHO* was invented). It was a dud because the home user wanted something powerful, not wimpy.

What's happening today is similar to what happened in the early 1980s when too many people thought a Commodore 64 or a VIC-20 (gads) was a computer that they might actually use. The attraction was a dirt-cheap price and the promise of usefulness. (The latter turned out to be true; they proved quite useful as closet decorations and doorstops.) The serious people were buying the most machine they could afford and convincing corporate America to buy these machines too.

Over time, these power users have probably done more to upgrade home systems than companies have done to upgrade office systems. Finding ways to get the laggards in corporate America to upgrade has been the goal of Intel and other vendors. America's public schools are even worse. Most kids from computer-using families have better machines at home than at school.

The hot-selling SOHO machines will not be simple, slow-dog machines but hot, fast power computers. But that reality is not what the marketers and the public will be seeing in the months ahead as a bogus home market is opened up only to flop eventually. Yes, there are a few million people who have toyed with the idea of owning a computer. They don't know why they want one, but if it's cheap enough, they'll buy one and play with it for a while. Such market fads come and go. The VIC-20 buyer epitomized this crowd as did, to some extent, the Sinclair Z-100 buyer. This market is about as stable and reliable as the Pet Rock aftermarket. For some odd reason, Bill Gates has always lusted after the home market. Just look at Microsoft's efforts with the MSX-home-operating-system floperoo and, more recently, its desire to get into TV cable boxes.

Almost everyone who needs or can use a computer for *anything* already has one! Some have two. The SOHO market is an old, saturated market, folks. It's not the key to any new riches.

The hot-selling PC for the home market will not be a wimpy, slow-dog machine but a fast power computer.

Illustration by Timothy Carroll

SyDOS Turns The Competition Inside.....Out

Introducing SyDOS Marlin 105i and PUMA 105

The First 3.5" High Performance INTERNAL And EXTERNAL 105MB Removable Cartridge Disk Drives!

MARLIN 105™

Marlin 105i - What A Catch! The Marlin 105i gives you all the benefits of a compact, high-performance, 105MB internal removable cartridge disk drive for your PC and AT-compatible computer.

Compatible With Virtually All AT-Type Systems. The **Marlin 105i** comes complete with 105MB data cartridge, 16-bit IDE Host Adapter, easy Windows™-like installation software, cables, manuals and mounting brackets for installation in any 5.25" or 3.5" computer bay, giving you maximum flexibility. And, the **Marlin 105i** can co-reside with other fixed drives and peripherals operating from MFM, ESDI, SCSI, RLL or IDE adapters.

Fast Performance. The **Marlin 105i** is designed around proven Winchester technology that provides you storage in 105MB increments. The cartridges are so small that they can fit in your shirt pocket! And, with an access time of 14.5 msec, the **Marlin 105i** gives you the performance and reliability you find in fixed drives.

Unlimited Capacity. There is no limit to capacity using the **Marlin 105i** drive, because there is no limit to the number of 105MB cartridges you can use. Cartridge technology eliminates your every storage constraint. So, whatever your storage requirements — data security, data organization, data transportability, or backup — you will never run out of storage space. Just pop in another 105 MB cartridge!

Plug Into The Power Of PUMA. The first truly portable 105MB external removable cartridge disk drive. Now you can capture the faster, high-performance and greater capacity of a portable storage solution.

Maximum Portability. With all of the performance and unlimited storage features of the Marlin 105i, the **PUMA 105** external is your answer to portable storage. The **PUMA 105** has a convenient handle built into its compact case for easy carrying. Plus, the compact 3.5" data cartridge is small enough to fit in your shirt pocket. So, if one of your many computing requirements is backup, the **PUMA 105** is your answer. Just carry it from computer to computer.

Easy Installation. PUMA 105 drives have been designed for fast easy installation to the parallel port of virtually any DOS or Windows-based desktop, notebook or laptop system. In addition to the parallel port adapter, the **PUMA 105** comes with a printer "pass-thru" to allow simultaneous connection of the drive and a printer to the same parallel port. Just plug the **PUMA 105** in, run the easy-to-use Windows-like software, and in seconds you are up-and-running.

Optional Battery Pack. SyDOS offers an optional battery pack which allows up to five hours of use with the **PUMA 105**, providing maximum portability.

So, whether you are considering an **INTERNAL** or **EXTERNAL** removable disk drive, consider the Marlin 105i or the PUMA 105 by SyDOS, the leader in removable mass storage solutions.

Fixed Drive Performance - The Marlin 105i and PUMA 105 use proven Winchester technology and achieve access times of 14.5 msec, the same type of performance found in fixed disk drives.

Removability Second To None - The compact 3.5" 105MB removable SyQuest data cartridges are ideal for data organization, transportability, unlimited storage, backup and data security. SyDOS removable drives are the all-in-one solution to your every computing need.

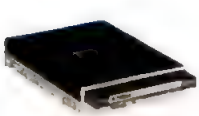
Superior Performance To Tape - SyDOS 105MB removable cartridge disk drives perform backup faster than tape — you can back up 105 megabytes in as little as five minutes. When you need the information, just insert your cartridge and data is readily available. No time is wasted restoring archived tape files.

Superior Performance To Optical - The use of Winchester technology allows the SyDOS drives to achieve access times of 14.5 msec. That is hard-drive performance, three times faster than optical.

Higher Reliability Than Floppies - SyDOS drives utilize SyQuest technology — the #1 removable cartridge product, with over 800,000 installations and 3 million cartridges in use worldwide. SyDOS drives use hard-disk platters, while floppy-based systems utilize flexible media, which gradually wear from constant flexing.

Unsurpassed Warranty - Both drives come with an unsurpassed warranty — two years on the drive and five years on the cartridge. And, you can reach our Customer Support Team toll-free at 1-800-536-7936.

Call Today - To find out how you can reel in a Marlin 105i, or snare a PUMA 105, call 1-800-**43SYDOS** today!

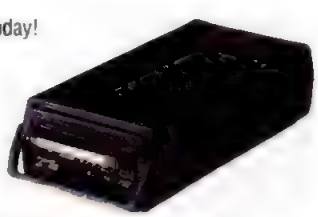


FEATURING SyQuest REMOVABLE TECHNOLOGY

SyDOS™

A Division of SyQuest Technology

MICROSOFT WINDOWS COMPATIBLE



6501 Park of Commerce, Suite 110, Boca Raton, Florida 33487 (407) 998-5400 FAX (407) 998-5414 1-800-**43SYDOS**

™SyDOS, MARLIN and PUMA are trademarks of SyQuest Technology

CIRCLE 279 ON READER SERVICE CARD

™Windows is a trademark of Microsoft Corporation

John C. Dvorak

Inside Track

Pentium, Pentium, Who's Got the Pentium Dept.: Well, gee, after a year, Intel has finally decided to do the 0.6-micron version of the Pentium, which it should have **done in the first place.** I'm betting that the new version of the chip will eventually replace the old 0.8-micron version completely. This one will work right and come out at 80 MHz and probably go to 100 MHz or more shortly thereafter. Using 3.3-volt technology, it will be cooler and usable in notebooks too. One trade journal calls this the Pentium II. I call it the real Pentium. The other one is a placeholder—a marketing gimmick (similar to Windows NT).

In the future, Microcom's MNP 10 protocol may be the key to using high-speed cellular modems. MNP 10 was developed to adapt to fluctuating line quality, especially in cellular connections.

I always thought that the PC makers using the original Pentium (Pentium "Classic"?) should have built the PCs with the chip on the outside of the machine. That way you could put a pot of water directly on the chip and use it to **make coffee.** A dual-purpose computer, eh? My advice to people wanting a Pentium—get the new version.

More Network Humor Dept.: *This ditty has been floating around as Urban Folklore and comes from IBM off of the VMSHARE forum. Perfect to cut out and post on the corkboard.*

Client/Server Is like Teenage Sex
- It's on everyone's mind all the time.
- Everyone is talking about it all the time.
- Everyone thinks everyone is doing it.
- Almost no one is really doing it.
- The few who are doing it are (a) doing it poorly, (b) sure it will be better next time, (c) not practicing it safely.
- Everyone is bragging about their successes all the time, although very few have actually had any successes.

DOS Is Dead Dept.: If you talk to enough vendors, you'll discover that retailers are no longer interested in DOS products. Microsoft and the Windows folk have done a marvelous job of convincing the big boys that DOS is dead and Windows is in. Of course, it takes **two to tango,** and the public is looking for Windows versions of everything. So my friend Mike Cuthbertson, the superb coder of that old **classic,** Hotshot Graphics, developed a DOS upgrade, and now he can't get it into the channel. "They don't care how good it is!" he tells me.

Plug Time: The product is Hotshot Graphics 2.0 and it's an outstanding image-capture/conversion program done by a guy who specializes in this kind of code. One feature of this product is its amazing ability to take photo images and print them beautifully on either a 300-dpi laser printer or a color printer. The printouts are **shockingly great.**

If you have a laser printer or an HP DeskJet 1200C, this program is a must. It also lets you capture full Super VGA screens and crop and **convert** any image. It's $199 ($95 for users of Hotshot Graphics 1.0) from Symsoft Corp., P.O. Box 10005, Incline Village, NV 89450; phone, 702-832-4300; fax, 702-832-4310.

Modem Watch: I was criticized by a reader who bought into the dead-end V.32terbo nonstandard modem being hawked by a few modem makers instead of jumping to the quasi-standard-not-yet-finalized V.FAST modem, which runs at a true 28.8 Kbps. (V.32terbo is something dreamed up by AT&T and is garnering very few subscribers.) So I see that Microcom, the company that brought you the unique MNP standards used by most modem manufacturers for error correction and other needed benefits, has brought out a V.FAST modem (technically called a V.FAST "class" since the specification isn't final). Using the company's new **MNP 10 protocol,** the modem hooks to a **parallel port** instead of a serial port! At $500 each, two of these modems will pay for themselves rather quickly in long-distance charges. MNP 10 is interesting because it was developed to adapt to fluctuating line quality and especially to cellular connections. It may be the **key to using cellular modems** for **high-speed** connections in the future. Let me say as an aside that I'm not a fan of those proprietary radio-based networks for portable computing use, and I prefer the idea of cellular networks. Call Microcom in Norwood, Massachusetts, at 617-551-1000 for more information. Cool stuff.

Finally Dept.: Well, here's another version of an old **controversy.** Ever since the Nintendo and Sega games showed up as rentals at Blockbuster, I expected CD-ROMs to be next. Indeed, **rentable CD-ROMs** have started to appear. I'd think that the software vendors would hate this concept, but Interactive Media is actually testing Rosehill Video in Kirkland, Washington, as a place where you can rent CD-ROMs. Of course, this is just a sampler, but soon we can expect all the CD-ROMs to be rented like videos. This means that we'll have to rethink the concept of software rental and the **software rental scams** that go with it. When are the courts going to make a decision on the legality of all this? Soon, I hope. □

20 years.

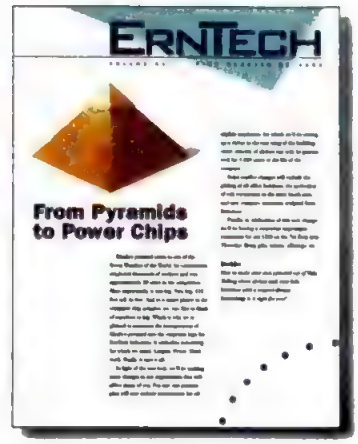
100,000 men.

752 casualties.

Introducing the new HP ScanJet IIcx. Scans done easily for just

$1,179.

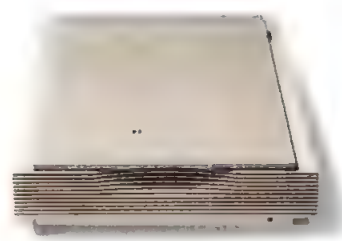
It's that simple. A click, a pass, an image—ready to be saved or incorporated into any document. With the added efficiency of HP DeskScan software, the HP ScanJet IIcx captures images in seconds. And with a TWAIN interface, you'll never have to leave your document to get them.



One click.

One pass.

One scanner.

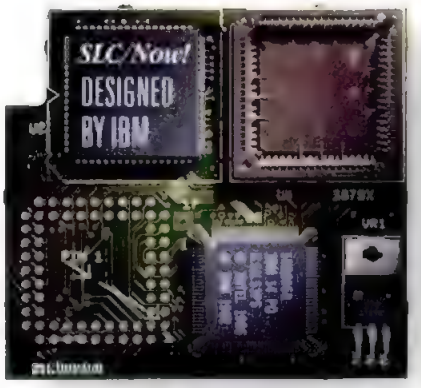


But simplicity is just part of the story. The HP ScanJet IIcx provides 256 levels of gray, 24-bit color, and 1600-dpi enhanced resolution (400-dpi optical) for scans that are always detailed, always accurate. HP's AccuPage 2.0 technology aids third-party OCR software in recognizing hard-to-read text, thereby speeding up text scans. And Aldus™ PhotoStyler™ SE software allows you to edit scanned images without the need for additional software. Available as options are an automatic document feeder and our new transparency adapter.

With all this, it's easy to see why we're the number one PC scanner. So call now at 1-800-SCANJET, Ext. 7802† for more information or for the name of your local authorized HP dealer.

HEWLETT® PACKARD

Suggested U.S. list price. †In Canada call 1-800-387-3867, Ext. 7802. Aldus is a trademark of Aldus Corporation in the U.S. and other countries. PhotoStyler is a trademark of U-Lead Systems, Inc. in the U.S. and other countries and is licensed to Aldus Corporation. Pyramid data is estimated. ©1993 Hewlett-Packard Co.



$425

$3,280

KINGSTON PROCESSOR UPGRADES. SAVE YOUR SYSTEM AND A BUNDLE.

Significant Savings, Equivalent Performance.
Kingston's IBM designed SLC/Now! plus SX/Now!, 486/Now! and MCMaster processor upgrades make existing systems perform like new 386SX, 486SX or 486DX models. They provide the power needed for today's software, perform comparably to new systems and cost at least 70% less.

Upgrade	Before	After	New System	System Supported
SX/Now!	IBM-AT	With SX/Now! 25	PS/2 Model 57SX-045	SX/Now!
Landmark Speed 2.0: Recount: Retail Price:	8 MHz 5:44 Min.	35 MHz 1:51 Min. $215	22 MHz 1:54 Min. $1,545	286-based systems from AST, Compaq, Epson, Everex, Hewlett-Packard, IBM, NEC, Toshiba and Zenith
SLC/Now!	PS/2 Model 50	With SLC/Now! 50	PS/2 Model 90-0H9	SLC/Now!
Landmark Speed 2.0: Recount: Retail Price:	13 MHz 3:34 Min.	114 MHz :29 Sec. $425	84 MHz :38 Sec. $3,280	IBM PS/2 Models 50, 50Z and 60
486/Now!	PS/2 Model 70-25MHz	With 486/Now! SX 25	PS/2 Model 90-0H9	486/Now!
Landmark Speed 2.0: Recount: Retail Price:	39 MHz :55 Sec.	84 MHz :39 Sec. $495	84 MHz :38 Sec. $3,280	IBM PS/2 Models 70 and 80, Compaq Deskpro Models 386/16, 386/20, 386/20e, 386/25, 386/25e, 386/33
MCMaster	PS/2 Model 55SX	With MCMaster SX 25	PS/2 Model 90-0H9	MCMaster
Landmark Speed 2.0: Recount: Retail Price:	16 MHz 2:47 Min.	84 MHz :36 Sec. $795	84 MHz :38 Sec. $3,280	IBM PS/2 Models 55, 56, 57, 65, 70, 80 and 90

All systems tested with 16MB installed except MCMaster, tested with 8MB on-board and 8MB on mother board. All system prices are MSRP at standard configuration as of 4/1/93. Processor upgrade prices are MSRP as of 4/1/93. Recount conducted on 3MB Excel for Windows spreadsheet generated by Kingston Technology.

Quality is Assured.
Bench testing of each and every product with the original system diagnostics and certification by the National Software Testing Laboratory provides the maximum assurance of individual product quality and compatibility.

yes
It runs with NetWare

Full Compatibility.
Kingston's processor upgrades are tested to be fully compatible with today's most popular operating environments including MS DOS, Microsoft Windows, IBM's OS/2 and Novell Netware.

More Information.
Contact your nearby Kingston dealer or give us a call at (800) 835-6575 to find out which processor upgrade is best for you.

[800]

Kingston Reliability.
Like our memory products, every processor upgrade is individually tested prior to shipping, supported by free comprehensive technical assistance and backed by a five-year warranty.

Kingston TECHNOLOGY CORPORATION

THE INSIDE NAME IN UPGRADES

17600 Newhope Street, Fountain Valley, California 92708 (714) 435-2600 Fax (714) 435-2699

All Trademarks, Registered Trademarks and Logos are of their respective holders. Kingston and Kingston Technology are Registered Trademarks of Kingston Technology Corporation. MCMaster is a Trademark of Aox, Inc. Both SX/Now! and 486/Now! are currently certified by The National Software Testing Laboratory. Certification for recent introductions, MCMaster and SLC/Now!, is pending. Developer tested only. Novell makes no warranties with respect to these products.

CIRCLE 106 ON READER SERVICE CARD

Jim Seymour

Breaking the Paper Chain

At most companies I visit, the notion of a "paperless office" is so far from reality that it's hard to use the phrase with a straight face. Not surprising: I can't imagine us truly *eliminating* paper for a very long time; it's just too useful. Yet most offices could easily cut back on their use of paper, to the benefit of everyone in the paper chain and, of course, the environment.

Our ubiquitous PCs are more a hindrance than a help in this. Just click on the print command, and the laser printer spews out another 35 pages. E-mail may have cut down on the volume of memos floating around the office, but in almost every other way, PCs have tended to generate *more* paperwork, not less. Sad, but true.

You can change that. You can't change people's habits by lecturing them; and I don't think many of us change our ways because we see cutesy little signs posted over copiers and in hallways and restrooms. But you *can* change people's behavior by example.

Over the past year I've taken two small steps, which have begun to take root in companies across the country.

My first cause has been to get people printing routine work on both sides of pieces of paper. In my office, we print everything two-sided except some correspondence, and graphs that must be compared side by side to be meaningful. Because we use auto-duplexing laser printers, it's easy.

We buy a lot less paper, we file a lot less paper, and we throw away a lot less paper.

The next step was to take that notion into the larger world. So for the past year, I vowed to take or send nothing to consulting clients that wasn't printed on both sides. That has drawn a number of questions from clients—typically, "how do you do that?", which is a great icebreaker.

I found many of them rely on the same Hewlett-Packard LaserJet IIISi and 4Si duplexing network laser printers we use, but not using the duplexing feature. When I asked workers why they didn't use that feature, I was inevitably told that they didn't know it existed, or that no one had shown them how. Was it, ummm, very difficult?

It's frustrating to find that a problem has an answer already in place but not being used. But that also makes it easy to turn things around quickly.

It takes only a minute to show people how to use duplexing. If your office has duplexing printers, make sure your coworkers know how to use that feature. If not, push for the IS department to buy duplexing machines in future purchases.

My second attempt at behavioral change has been even more fun.

ELECTRONIC HANDOUTS

I've long printed out "audience notes" handouts for the computer-originated slide shows I rely on. With an image of each slide and adjacent space for each person's notes, these handouts help keep a group focused and encourage the audience to add their own notes. All the major presentation-graphics packages produce these handouts automatically, so the effort involved is nearly zilch.

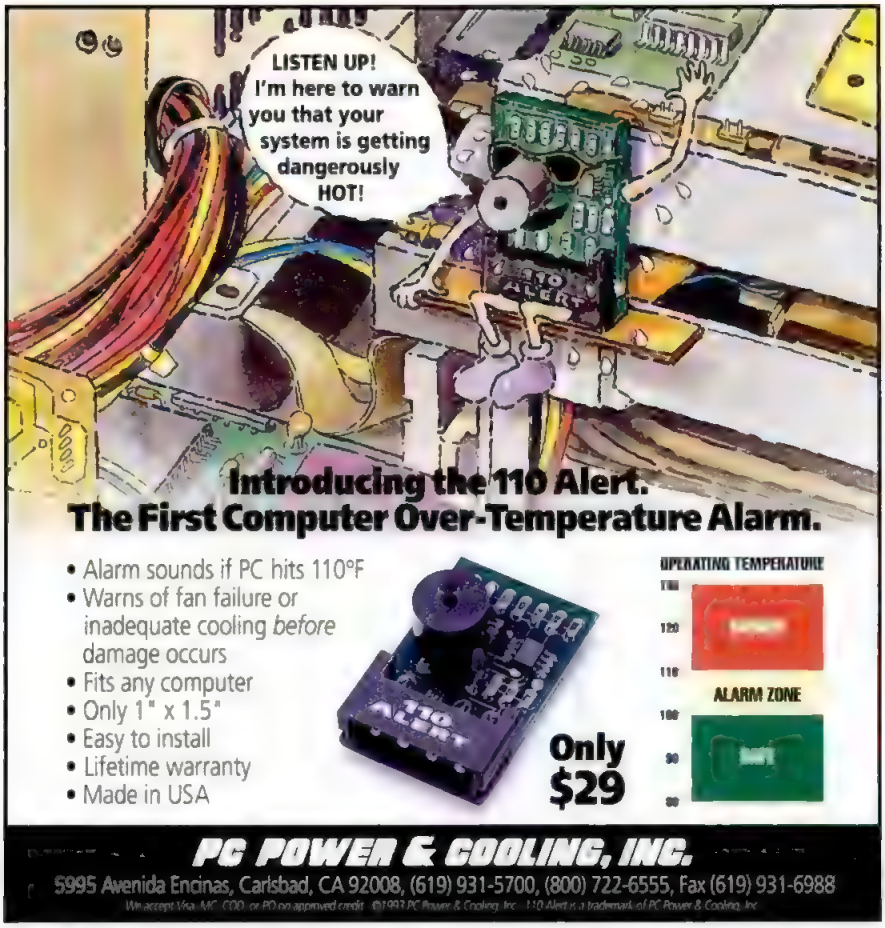
Creating a paperless office takes more than computers and lip service. It takes action.

I also usually carry along a stack of sets of Xeroxes of related material—white papers, research summaries, relevant clips, and so on. Which, of course, someone passes out at the appropriate time.

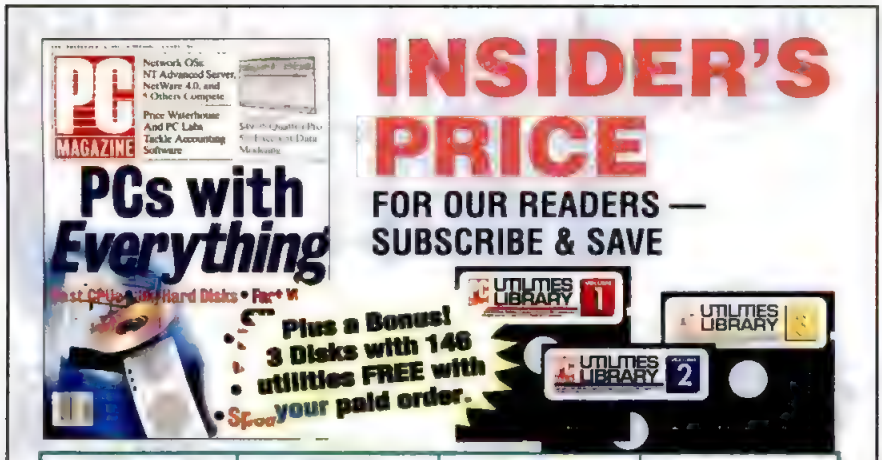
I doubt that I'll convert the slide-notes handouts to electronic form any time soon—I want people scribbling on them as I talk—but last January, I started carrying that back-up material on-disk. *Only* on-disk.

And when the time came to hand it out, 3.5-inch disks were passed out, instead of half-inch-thick stacks of Xeroxes.

Illustration by Timothy Carroll



CIRCLE 076 ON READER SERVICE CARD



ANNUAL COVER PRICE	REGULAR SUBSCRIPTION PRICE	YOUR PROFESSIONAL RATE	BONUS STATUS
~~$64.80~~	~~$44.97~~	$29.97	3 FREE DISKS

Subscribe now, and get 22 issues for only $29.97 — that's 54% off the annual cover price! Better yet, sign up for two years and get 44 issues for just $49.97 — a savings of 62%! Along with your order you'll also get PC Magazine's **"Utilities Library"** on 3 disks — **FREE** with your paid subscription!

ONE YEAR	TWO YEARS
24 issues for $29.97. YOU SAVE 54%!	44 issues for $49.97. YOU SAVE 62%!

Call toll-free today: 1-800-289-0429

Canada and foreign add $36.00 per year. U.S. funds only. Canadian GST included. Please allow 30 days for shipment of first issue. FREE disks will be sent upon payment.

Jim Seymour

The first time I did this in each client company, I saw a few cocked eyebrows and *whazzis?* looks among audience members. No one ever stopped my presentation, but when I finished the slides, there was always a question about the disk.

Which was a perfect setup for me to explain that I'd put the supporting material on the disk so they could print out the parts they really wanted, view the rest on-screen, and file the whole thing easily.

The kicker was that I also put my slide show on that disk, so, as I explained, they could show it to others who might need the information, copy and use any or all of the slides in their own presentations, or simply review the slides themselves, at their convenience. (Needless to say, I use the presentation program in use in their company for the slides. It's almost always Freelance or PowerPoint, so that's no problem.)

They love it.

If I went into those companies and started handing out stacks of paper again, I'd get lynched. Time and again, people who've been in these meetings have stopped me in the hallways on a subsequent visit, or called or written, to tell me of their own success in handing out disks of background material, rather than unwieldy stacks of paper.

Though this isn't effortless at my end, the effort is small. If the material I want to put on the disk isn't already in electronic form (rare, since much of it comes from on-line research), it may have to be scanned. Occasionally, it also has to be put through an OCR, with the resulting tedious clean-up, but very often we just put the scanned TIFFs on the disk: People don't need what amounts to clips in editable ASCII form. And we put a simple table of contents, as an ASCII README.TXT file, on the disk.

The disks have to be copied in whatever quantity is required, which takes longer and is sometimes (though not always) a little more expensive than photocopying. I also have to find a place in my traveling bag to stuff those dozen or 20 disks.

But it's worth the effort. It delivers real value to my clients, and it has gone a long way toward changing their behavior—by example, not by dictum.

Are there similar ways that you could change your coworkers' paperwork habits by your own good example?

MediaMagic.™

The Trick to Mastering Multimedia.

A family of audio boards that perform like magic.
There's a trick to getting the most from multimedia. It's MediaMagic™. Our full-family of audio boards and sound systems deliver high-quality sound and outperform the competition without their high price or difficult installation.

Introducing the ISP-16 Audio Board. $99

When multimedia is more than a game.
The ISP-16 is big news for cost-conscious users. At just $99, you can buy two boards for the price of one Sound Blaster 16. And the features are identical. Both have 16-bit stereo sound, record and playback, 20-voice FM synthesis and CD-ROM interface. But only our ISP-16 supports popular Sony CD-ROM drives. Get our professional quality ISP-16 for a game-board price. Or upgrade to the ISP-16 Sound System, complete with CD-ROM drive, custom speakers and popular CD-ROM titles for hundreds less than our competition.

Enhance your multimedia experience with DSP-16 — For affordable, high-performance sound.
MediaMagic Digital Signal Processor (DSP) boards offer quality digital audio at affordable prices. You get 16-bit, 48kHz stereo, a CD-ROM interface and a joystick/MIDI port all in one package. Unlike other boards, the DSP-16 is compatible with AdLib, Sound Blaster, Business Audio, Windows Sound System and MPC-2. DSP-16 will also support future audio standards with a simple software upgrade while other boards just become obsolete.

DSP-16 SCSI and DSP-16 Plus – The ultimate in multimedia sound.
MediaMagic DSP-16 SCSI and DSP-16 Plus Audio Boards have all the features of the DSP-16 and more! Choose the DSP-16 Plus for MPEG II real-time data compression and WaveMagic, the wavetable MIDI synthesis professional musicians use. Or choose the affordable DSP-16 SCSI, and upgrade to WaveMagic with MPEG II later!

Products:	Digital Audio	Upgrades	Wave Table	CD ROM	Real-Time MPEG Audio	Price*
MediaMagic™ DSP-16 Plus	16-bit 48 Khz	Yes	Standard	SCSI	Yes (encode/decode)	$259.00
Sound Blaster 16 ASP	16-bit 44 Khz	Yes	Expensive Upgrade	Proprietary	No	$349.95
ProAudio Spectrum-16	16-bit 44 Khz	No	No	SCSI	No	$299.00

*Base SRP

MediaMagic Sound Systems — The complete multimedia solution.
We've combined our powerful MediaMagic audio boards with Sony and Toshiba CD-ROM drives, high-quality stereo speakers and popular CD-ROM titles for turnkey multimedia solutions that are powerful, affordable and easy to use.

Trade-up today and get up to $50 Cash Back

It pays to upgrade your system! Purchase one of our DSP audio boards, send us your old 8-bit board by January 31, 1994 and receive up to $50 cash back.
Price. Performance. Upgradeable. And a generous trade-up program. When multimedia sounds too good to be true, it's no trick. It's MediaMagic™ For your nearest dealer, or for more information, call:

800-624-8654

MEDIA MAGIC™

USA: MediaMagic, a division of Austin Computer Systems, 10300 Metric Blvd., Austin, Texas 78758 Tel: 800-624-8654 Fax: 512-454-1357 International: IPC Corporation LTD. 23 Tai Seng Drive, Singapore 1953 Tel: 65-744-2888 Fax: 65-287-6806

© 1993 MediaMagic, a division of Austin Computer Systems. All rights reserved. MediaMagic is a trademark of IPC Corporation LTD. All other company names and products are trademarks or registered trademarks of their respective owners. Specifications subject to change without notice.

CIRCLE 325 ON READER SERVICE CARD

Any Way You

Any PC System Configuration. Any Software Bundle. Built And Suppo

AMERICA ONLINE 10 HRS. FREE WITH EVERY SYSTEM.

When you buy a system from us you can also plug into electronic magazines, newspapers, E-mail and message boards for up to 10 hours for free.

486SX/33 WITH 210MB HD, MONITOR

#818883

- Intel486SX/33
- 4MB RAM
- 1.44MB 3½" Floppy Drive
- 1.2MB 5¼" Floppy Drive
- 1MB Super VGA Card
- 210MB Hard Drive
- 14" Super VGA .28 Non-Interlaced Monitor
- MS-Windows 3.1 / MSDOS 6.2 & Claris Works
- 101-Key Enhanced Keyboard & Mouse

PENTIUM OVERDRIVE PROCESSOR UPGRADABLE

intel inside

We feature Intel inside every computer shown.

$1,299

$48/MO*

486DX2/50 WITH 210MB HD, LB VIDEO, MONITOR

#818894

- Intel486DX2/50
- 4MB RAM
- 1.44MB 3½" Floppy Drive
- 1.2MB 5¼" Floppy Drive
- 1MB Local Bus Video Card
- 210MB Hard Drive
- Dual VL Slot Local Bus Motherboard
- 14" Super VGA .28 Non-Interlaced Monitor
- MS-Windows 3.1 / MSDOS 6.2 & Claris Works
- 101-Key Enhanced Keyboard & Mouse

PENTIUM OVERDRIVE PROCESSOR UPGRADABLE

$1,799

$67/MO*

486DX2/66 WITH 210MB HD, LB VIDEO, MONITOR

#818872

- Intel486DX2/66
- 4MB RAM
- 1.44MB 3½" Floppy Drive
- 1.2MB 5¼" Floppy Drive
- 1MB Local Bus Video Card
- 210MB Hard Drive
- Dual VL Slot Local Bus Motherboard
- 14" Super VGA .28 Non-Interlaced Monitor
- MS-Windows 3.1 / MSDOS 6.2 & Claris Works
- 101-Key Enhanced Keyboard & Mouse

PENTIUM OVERDRIVE PROCESSOR UPGRADABLE

$1,899

$70/MO*

THE PENTIUM POWER TOWER

#818271

- Intel Pentium 60MHz CPU
- Compudyne Full Tower Case
- 8MB RAM
- 1.44MB 3½" Floppy Drive
- 1.2MB 5¼" Floppy Drive
- 540MB Hard Drive
- Diamond Viper 1MB Super Local Bus Video Card
- 15" Super VGA .28 Non-Interlaced Monitor
- MS-Windows 3.1 / MSDOS 6.2 & Claris Works
- 101-Key Enhanced Keyboard & Mouse

MICROSOFT WINDOWS READY-TO-RUN

Every computer shown is Microsoft® Windows™ Ready-to-Run

$4,499

$166/MO*

SERVICE

Open 7 days a week our in-store service dept. will service any brand of computer with over a half million dollars of on-hand parts.

CHOICE

With thousands of brand name computers in stock, you can have custom configured systems built to fit you by our Novell certified technicians.

1-800 AFFORDABILITY

We shop the competitors to offer you the lowest price. And because we're nationwide, you can buy direct and we'll ship out of the store nearest you.

CORPORATE EASE

Our corporate support includes: leasing, networking, corporate negotiated price list and a special pickup window so your order is ready when you are.

Want It.

ted From Your Nearest CompUSA Store.

Microsoft · Maxtor · Caviar · CONNER The Storage Answer · CREATIVE · DIAMOND Computer Systems, Inc · STB Systems, Inc

BASES AND BUNDLES

*Base Systems do not include hard drives, video cards or monitors.

BASE SYSTEMS

1

486SX/33
#818752
- Intel486SX/33
- 4 MB RAM
- 1.44 MB 3 1/2" Floppy Drive
- MS Windows 3.1/MSDOS 6.2 & Claris Works
- 101-Key Enhanced Keyboard & Mouse

649.99*

2

486DX2/50
#818761
- Intel486DX2/50
- 4MB RAM
- 1.44 MB 3 1/2" Floppy Drive
- MS Windows 3.1/MSDOS 6.2 & Claris Works
- 101-Key Enhanced Keyboard & Mouse
- Dual VL Slot Local Bus Motherboard

949.99*

3

486DX2/66
#818770
- Intel486DX2/66
- 4 MB RAM
- 1.44 MB 3 1/2" Floppy Drive
- MS Windows 3.1/MSDOS 6.2 & Claris Works
- 101-Key Enhanced Keyboard & Mouse
- Dual VL Slot Local Bus Motherboard

1,099.99*
$41/MO*

UPGRADES

A

Base System 1 Plus #818781
- 210 MB HD
- VGA Card
- 14" Super VGA .39 Monitor

$1,099 $41/MO*

Base System 2 Plus #818814
- 210 MB HD
- Super VGA Card
- 14" Super VGA .39 Monitor

$1,499 $55/MO*

Base System 3 Plus #818841
- 210 MB HD
- 1 MB Local Bus Video Card
- Fax Modem
- 14" Super VGA .39 Monitor

$1,799 $67/MO*

B

Base System 1 Plus #818792
- 210 MB HD
- 512K Super VGA Card
- Fax Modem
- 14" Super VGA .39 Monitor

$1,199 $44/MO*

Base System 2 Plus #818823
- 340 MB HD
- 1 MB Local Bus Video Card
- Fax Modem
- 14" Super VGA .28 NI Monitor

$1,699 $63/MO*

Base System 3 Plus #818850
- 340 MB HD
- 1 MB Local Bus Video Card
- 1.2 MB 5 1/4" Floppy Drive
- Fax Modem
- 14" Super VGA .28 NI Monitor

$1,999 $74/MO*

C

Base System 1 Plus #818805
- 210 MB HD
- 512K Super VGA Card
- 1.2 MB 5 1/4" Floppy Drive
- Fax Modem
- 14" Super VGA .28 NI Monitor

$1,399 $52/MO*

Base System 2 Plus #818832
- 340 MB HD
- 1 MB Local Bus Video Card
- 1.2 MB 5 1/4" Floppy Drive
- Fax Modem
- 15" Super VGA .28 NI Monitor

$1,999 $74/MO*

Base System 3 Plus #818861
- 540 MB HD
- 1 MB Diamond Viper Super Local Bus Video Card
- 250MB Tape Backup
- 1.2 MB 5 1/4" Floppy Drive
- 14.4 Fax/Modem
- 15" Super VGA .28 NI Monitor

$2,799 $104/MO*

FAVORITE OPTIONS NOW AVAILABLE

- *Conner Diskstor 250 Tape Backup*
- *Compudyne 1.2 MB 5.25" Floppy Drive*
- *Compudyne 14.4/14.4 Kbps Send/Receive FAX/Modem*
- *Creative Labs Omni CD kit, Dual Speed CD w/Controller*

intel inside

MULTIMEDIA UPGRADE KITS

Compudyne Multimedia Upgrade kits include quality audio cards, internal CD-ROM drives and a special selection of multimedia software so you can enter the world of multimedia computing immediately.

COMPUDYNE

800-COMP USA

COMPUSA

THE COMPUTER SUPERSTORE

OPEN 24 HOURS A DAY, 7 DAYS A WEEK.

24 HR FAX: 800-FAX-2212
INTERNATIONAL PHONE: 214-888-5770
INTERNATIONAL ORDERS WELCOME
ON OUR 24 HR FAX LINE: 214-888-5706
CIRCLE 144 ON READER SERVICE CARD

PCM0142

GOVERNMENT/EDUCATIONAL SALES CALL:
· 800-862-3088 ·
FAX: 214-888-5783 · COMPUSA GSA#: GS00K93AGS-6319

SUPPORT

Toll-free and 900# service lines, non-commissioned sales experts and computer training in-store or on-site.

MAINTENANCE

We offer upgrades, on-sight service, next-day response, extended warranties and tailored maintenance agreements to suit your needs.

Leasing arranged through Leasing Group, Inc., payments based on 36-month open-end rate. Must be returned "as new" in original packaging. Within the continental United States. Each system will be shipped from the nearest CompUSA Superstore. CompUSA is not responsible for typographic / technical errors. Other limitations apply. Training courses not offered as vocational training or as qualifying one for any particular employment. Course credits not transferable to any accredited educational institution. In Texas, Nevada and Connecticut, classes are offered as employer sponsored courses, not open to general public. Prices and specifications subject to change without notice. Intel 486 and the Intel Inside logo are trademarks of the Intel Corp. Trademarks belong to their registered owners. CompUSA Direct, 15167 Business Avenue, Dallas, TX 75244

THERE ARE HUNDREDS OF REASONS TO USE WINDOWS NT.

AND ONE GREAT REASON TO TRY IT NOW.

Experience the new generation of applications

See how the new generation of 32-bit applications for Windows™ can change the way you work and make you more productive. When you get the Microsoft® Windows NT™ operating system for the special price of $295*, you'll get a free CD-ROM Windows NT Applications Sampler.

You'll be able to sample some of the hundreds of 32-bit applications that are on the market right now. Applications for accounting, CAD/CAM, manufacturing, and automation. Tools to help you run your business better. Because with Microsoft Windows NT, you can run a new wave of PC applications previously available only on minis and mainframes. And you're able to integrate them with the thousands of existing applications for Windows.

Windows NT: the foundation you need

New 32-bit applications need the power, security, reliability, and manageability of Windows NT. With full, 32-bit, preemptive multitasking, Windows NT saves you time.

It can also protect your investment. Because as your company grows, Windows NT provides a foundation that will grow with you. You can choose to add more processors or move to more powerful hardware (e.g., Digital® Alpha AXP™, MIPS® R4000 series, Intel® Pentium™) without having to change your operating system or applications software.

Get a free CD-ROM Applications Sampler

Get Windows NT today for only $295, and we'll send you a free CD-ROM Applications Sampler. But order today. This limited-time offer ends February 15, 1994.

Get Windows NT for only $295 and we'll send you a free CD-ROM Applications Sampler.

FOR A LIMITED TIME, GET WINDOWS NT FOR ONLY $295 AND RECEIVE A FREE CD-ROM APPLICATIONS SAMPLER. FOR THE NAME OF YOUR LOCAL RESELLER OR TO ORDER BY PHONE, CALL (800) 426-9400, DEPT. KY3.

Microsoft

*Plus freight and applicable tax. Offer good for users of any version of Microsoft Windows™, UNIX® or OS/2® operating systems. Offer expires 2/15/94. Please allow 4-6 weeks for delivery upon receipt of your order by Microsoft. Reseller prices may vary. If you purchase Windows NT through a reseller, you'll receive a coupon to redeem your free CD Applications Sampler directly from Microsoft. © 1993 Microsoft Corporation. All rights reserved. Microsoft is a registered trademark, and Windows, Windows NT, and the Windows NT logo are trademarks of Microsoft Corporation. All company and product names are the trademarks of their respective companies. Alpha AXP is a trademark of Digital Equipment Corp. Intel is a registered trademark and Pentium is a trademark of Intel Corp. OS/2 is a registered trademark of IBM Corp. MIPS and R4000 are registered trademarks of MIPS Systems, Inc. UNIX is a registered trademark of UNIX Systems Laboratories. Offer good only in the 50 United States. In the 50 United States, call (800) 426-9400. For information only: in Canada, call (800) 563-9048; outside the 50 United States and Canada, call your local Microsoft subsidiary or (206) 936-8661. Recommended System Requirements: personal computer running a 486 or higher microprocessor; one high-density disk drive and a hard disk with 100 MB of free space; VGA, Super VGA, or video graphics adapter compatible with Microsoft Windows NT 3.1; and 16 MB memory minimum.

Bill Howard

An Environmental Celebrity

Energy Star has only just begun. You're going to see computer makers squeeze substantially larger energy savings out of computers, monitors, and printers before it's all over. So far, it's been a relatively painless process with little or no impact on your system's performance or its price. But the benefits may not be as clear-cut as you've been led to believe.

Energy Star, as you probably know, is the year-and-a-half-old brainchild of the Global Change Division (GCD) of the Environmental Protection Agency. Energy Star calls for PCs, monitors, and most printers to draw less than 30 watts each when inactive. The GCD is "tasked," as they say in Washington-speak, with keeping the lid on carbon dioxide and methane emissions, which are given off by power plants when they make electricity. PCs, monitors, and printers consume about five percent of all commercial-sector electricity.

GIVE AND TAKE

Unlike the EPA's mandatory fuel-economy rules for cars, Energy Star is carrot-and-stick voluntary. Vendors with products that comply get to display the Energy Star logo on their boxes and in their ads. That's the carrot. Then there's the stick: The U.S. government will buy only Energy Star–compliant computers, and some companies—to be good citizens and to save energy costs—are doing the same.

It turns out that the 30-watt specification for PCs, monitors, and printers wasn't all that tough to meet. The EPA says 180 PC and monitor makers and 29 printer makers have Energy Star certification. So the EPA is now asking manufacturers: How hard would it be to idle at 20 watts? At 10 watts? How about 5? At some point, the cost to implement Energy Star II or Energy SuperStar technology, as it might be called, may *not* be something that can be buried in the price of the system. Then again, maybe it can: We've seen new laser printers from HP and Okidata that idle at 4 to 10 watts and cost as little as $499.

Another challenge will be to make the idling PC's I/O devices work together. Modems and network cards will have to wake the PC promptly when the phone rings or when data destined for the PC comes across the LAN. At least initially, you may be more inclined to buy the PC and the I/O adapters from the same source so there's no finger-pointing if something goes wrong. In part because of the network-adapter issue, file servers are exempt from the government's Energy Star–only purchasing edict. Most of the Energy Star, Intel-architecture PCs we've seen so far are midrange 486s, not server-size 486DX2/66 or Pentium systems.

While the EPA says a PC can burn as much as $135 of electricity a year when left on around the clock, if you have a fairly current system that you turn off at night, your utility bill might be as little as $20 a year (certainly less than $40). If Energy Star cuts that to $10, what's your company going to do with the savings? Declare a special shareholder dividend?

BUT SERIOUSLY

Joking aside, there are reasons to buy Energy Star today and Son of Energy Star tomorrow. In big offices, they'll throw off less heat and put less of a load on your air conditioning. At home or in a small office, the low energy draw and the fact that the system *seems* to be off (the PC is silent and the screen is dark) will give you the confidence to leave your system on around the clock. That enables you to use your PC as a 24-hour-a-day fax machine and voice-mail system.

You can also get some of the benefits of Energy Star if you buy a new monitor and use a screen blanker with your existing PC. Some (but not all) new monitors will sense when the video adapter isn't putting out a signal and will go into power-saving mode. □

A clear conscience is just one benefit to be gained from the EPA's Energy Star standard.

Illustration by Timothy Carroll

Why is this perpetual power-seeker pleased ?
He just bought an
AMBRA
and got the most stingy stocking megabucks.

SPLIT-NANOSECOND NUMBER CRUNCHING.

100 MIPS

Doing complex financial modeling? CAD/CAM? Advanced applications of any kind? AMBRA puts the superior power of a **60 MHz Pentium processor** at your command! This true 64-bit Intel processor has what it takes — high-speed clocking, parallel execution, on-chip cache, specialized floating-point hardware, and more — to swiftly cut through your most intensive computing tasks.

IF you crave computing power, call AMBRA. For the latest technology — like Intel PENTIUM. And lots more. For lots less.

CACHE

floating-point unit

AMBRA

Pentium + PCI + Diamond Viper
Fully configured systems starting at **$3,099**

OPEN-THROTTLE THROUGHPUT

32 bits wide and 33 MHz fast, PCI carries a payload of 132MB of data per second!

PCI local bus

Say goodbye to I/O jams and hello to a jumperless future — at AMBRA, the PCI local bus has arrived!

In our Pentium processor-based ISA desktops, this heavy-load CPU-to-peripheral data carrier:

- Increases throughput
- Autoconfigures PCI adapter cards
- Provides a strong expansion base for high-performance peripherals

Networks

Multimedia

Disk drives

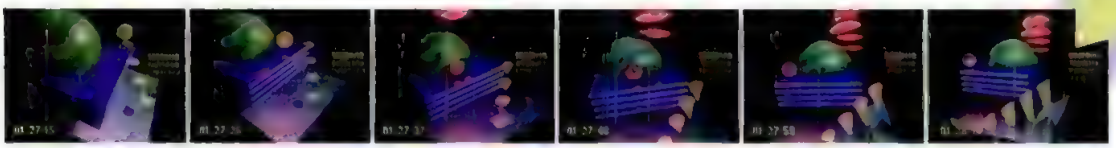
VESA local bus

Prefer VESA over PCI? AMBRA's selection of Pentium technology systems includes towers and desktops to suit.

Step up to Pentium processor power while protecting your investment in VESA option cards you may already have.

WARP-SPEED GRAPHICS. If you're talking accelerated graphics, AMBRA's talking 81 million Winmarks,[1] with the ***Diamond Viper PCI*** video card! This high-powered PCI graphics board provides 24-bit True Color (up to 16 million hues!), fast and flicker-free refresh rates, and super-rapid screen redraws. For VESA fans, AMBRA also has the Viper in a VL version. In addition, we offer the popular ***ATI® Mach 32 VL*** graphics accelerator.

81 MILLION WINMARKS



1-800-239-5415

HARD DISKS:

- 1GB (8.9 ms) SCSI-2
- 540MB (10.5 ms) SCSI-2
- 440MB (12 ms)
- 340MB (12 ms)
- 240MB (15 ms)
- 170MB (17 ms)

MULTIMEDIA:

- 2X CD-ROM drive
- Multimedia kit (2X CD-ROM drive, sound card, 2 speakers)

MONITORS:

- 14" AMBRA SVGA
- 14" AMBRA UVGA
- 15" AMBRA Flat Square Tube
- 15" NEC Multisync® 4FGE
- 17" AMBRA Flat Square Tube
- 17" NEC Multisync 5FG
- 21" NEC Multisync 6FG

MODEMS:

- 9.6 kbps internal
- 14.4 kbps internal

PRINTERS:

- IBM 2391 Personal Printer II
- IBM 4039 LaserPrinters
- IBM 4029 LaserPrinters

SCANNER:

- Calera WS Complete PC Scanner

EXPONENTIAL GROWTH

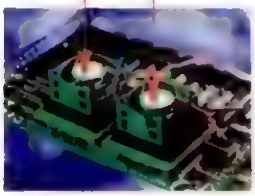
MAYBE YOU NEED A SYSTEM THAT'S BIG, BIG—AS WELL AS FAST, FAST. WE'VE DESIGNED A **DUAL PENTIUM PROCESSOR COMPLEX** THAT ALLOWS YOU TO DOUBLE YOUR COMPUTING POWER WHENEVER YOU CHOOSE.

We build TO YOUR SPECS for memory, storage, and more. And if one Pentium processor isn't enough, take TWO!

OUR DUAL COMPLEX IS AVAILABLE IN EISA TOWERS THAT OFFER 8 SLOTS AND 12 BAYS TO BUILD UPON.

POWER²

You can begin with one Pentium processor, then add another later. Say, when you're ready to tap the multi-processor support in an operating system like UNIX or Windows NT.™ If you're ready now, we'll create a dual-powered system for you without delay.



Pentium
+ VESA
+ 1GB hard disk

Fully configured systems starting at

$4,351

open-ended expansion. Require big-byte storage? We've got hard disks ranging up to **1GB!** Need to run a dozen high-speed peripherals? You can support as many as 14 drives and devices on a single slot, thanks to **built-in Fast SCSI-2!** Our Pentium processor-based ISA/PCI systems come with a Fast SCSI-2 controller **(10MB/sec throughput!)** on the PCI local bus. EISA/VESA systems feature onboard, **dual-channel** Fast SCSI-2.

Affordable Intel Pentium processor-based systems from AMBRA.

1 Model DP60/PCI

- Pentium processor, 60 MHz
- 64-bit data path
- 8MB RAM, max: 128MB
- 256KB processor cache
- 3.5" 1.44MB diskette drive
- 340MB (12ms) hard disk
- 4 ISA, 2 PCI, 1 PCI/ISA slot
- 6 storage bays
- PCI graphics accelerator, 2MB DRAM
- 14" SVGA color monitor, LR
- Desktop casing
- 200-watt power supply
- MS-DOS® 6.0, Windows 3.1, mouse

$2,799

2 Model DP60/PCI to the max, with:

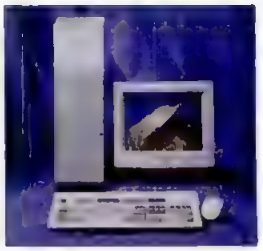
- 440MB (12ms) hard disk
- Diamond Viper PCI, 2MB VRAM
- 2X CD-ROM drive
- 15" Flat Square color monitor, LR, NI

$3,499

3 Model DP60E/VL

- Pentium processor, 60 MHz
- 64-bit processor complex
- 8MB RAM, max: 64MB
- 256KB processor cache
- 3.5" 1.44MB diskette drive
- 540MB (10.5ms) Fast SCSI-2 hard disk
- Onboard dual-channel Fast SCSI-2
- 8 EISA slots (2 VESA)
- 6 storage bays
- L45 ATI® Mach 32, 2MB VRAM
- 15" Flat Square color monitor, LR, NI
- Desktop casing (convertible to minitower)
- 200-watt power supply
- MS-DOS® 6.0, Windows 3.1, mouse

$3,999



4 Model TP60E/VL[3]

- Pentium processor, 60 MHz; upgradeable to dual processors
- Dual 64-bit processor complex
- 8MB RAM, max: 128MB
- 512KB processor cache
- 3.5" 1.44MB diskette drive
- 540MB (10.5ms) Fast SCSI-2 hard disk
- Onboard dual-channel Fast SCSI-2
- 8 EISA slots (2 VESA)
- 12 storage bays
- L25 S3 805 graphics accelerator, 1MB DRAM
- 2X CD-ROM drive
- 15" Flat Square color monitor, LR, NI
- Tower casing
- 350-watt power supply
- MS-DOS® 6.0, Windows 3.1, mouse

$4,719

intel inside

FIRM CONFIDENCE.

AMBRA covers every computer with a 30-day money-back guarantee and a one-year limited warranty. An optional IBM® one-year onsite warranty is also available to you.[2] With either warranty, you can rely on toll-free technical support 24 hours a day, 7 days a week.

In Canada,[4] call 1-800-363-0086, Ext. 5415

FREE CUSTOMIZATION. THE SYSTEMS YOU SEE HERE ARE JUST SOME OF YOUR CHOICES. AMBRA CUSTOM-CONFIGURES TO YOUR EXACT SPECS — PREINSTALLING AND/OR PRELOADING YOUR PICK OF MEMORY SIZES, HARD DISKS, OPTION CARDS, AND MORE — WITH NO EXTRA SERVICE CHARGE AND NO DELAY.

Full convenience.

To place an order or get more information, just call. AMBRA's lines are open every weekday 8 am to 9 pm, and Saturday 10 am to 6 pm (ET). We accept VISA®, MasterCard® and American Express®— as well as purchase orders from qualifying businesses. So pick up the phone, and get a direct line to Pentium processing power today.

AMBRA COMPUTER CORPORATION

1 ■ 8 0 0 ■ 2 3 9 ■ 5 4 1 5

[1] 1,024 x 768 x 256 colors at a 72 Hz refresh rate [2] Please call for details regarding AMBRA's money-back guarantee and limited warranty, and IBM onsite warranty. Return shipping and insurance charges are the responsibility of the customer. Onsite service may not be available in certain locations. [3] FCC Class A system, for use in a commercial environment only. [4] Offerings may differ in Canada.

© 1993 AMBRA Computer Corporation. AMBRA is a trademark of ICPI Ltd. and used under license therefrom. The AMBRA logo and logotype are trademarks of AMBRA Computer Corporation. IBM is a registered trademark of International Business Machines Corporation. Intel is a registered trademark and Pentium is a trademark of Intel Corporation. Windows and Windows NT are trademarks and MS-DOS is a registered trademark of Microsoft Corporation. All other product names are trademarks or registered trademarks of their respective suppliers. Offerings, prices and products are subject to change without prior notice. Prices do not include shipping.

Pentium: The Second Wave

For this new generation of desktop computers—the swiftest of the swift—speed is of the essence. *PC Magazine* evaluates 11 Pentium systems and a few alternatives for the PC power elite.

by Jim Seymour

All things come to those who wait. Or at the very least, fast, well-engineered, moderately priced Pentium PCs do. Those who sat out the industry's first burst of Pentium mania back in late summer and early fall of 1993 are now reaping the harvest of their patience or their penury.

The Pentium PCs we reviewed last year were clearly first stabs at implementing Intel's new powerhouse chip. If those PCs were less than optimized, they were nonetheless good: about 75 percent faster than 66-MHz 486DX2s, the previous speed champs, but disproportionately expensive for the additional computing power they provided. Vendors whose Pentium PCs were tested in the previous roundup have reported modest sales but were clearly looking forward to their next chance at the chip. They were also betting on greater availability of the Pentium chip—the most sought-after device in the PC business. Intel kept a tight rein on the few Pentium processors that emerged from their production lines, allowing only a trickle to spill into the market. Now for the torrent.

Pentium PCs are becoming, if not commonplace, at least widely available—and comparatively inexpensive. Intel says it shipped "several hundred thousand" Pentium chips in 1993, with "millions" more to come in 1994. PC vendors and motherboard makers who supply the processor on the board generally say they're getting as many chips as they need now. One indication of the wider availability of Pentium chips is that Gateway 2000, the highest-volume marketer of PCs in the direct channel, is delivering Pentium machines in bulk. The simple fact is that Gateway would not market a machine that it couldn't sell in high volume.

In our prior review of Pentium PCs, we predicted there would be three distinct waves of systems to hit the market: The first wave comprised a few very early machines from the industry's stalwarts and hit last spring. These systems were basical-

Photograph by Chris Gould

ly upgraded 486 designs, but with a lot more processing horsepower. We are now in the midst of the second wave, which is a little larger and also includes the products of some smaller-volume PC makers. The designs are robust and in some cases use system architecture that may take better advantage of the Pentium processor's unique abilities. On the other hand, many of the machines that comprise this wave are still rooted in 486 thinking.

What we're really waiting for is the expected onslaught of machines designed from the ground up as Pentium boxes. These systems will likely be available sometime in the first quarter of this year.

While we received fewer machines than we expected for this roundup, this group wrings more out of the Pentium processor—for a smaller price premium over 486 designs—than our first group of Pentium PCs did. And among the many Pentium machines demonstrated at Fall Comdex this past November, you'll find our predicted third wave of PCs—including many new systems that were explicitly designed to support the Pentium processor.

IN THIS REVIEW

AcerPower Series 9000 120
ALR Evolution V 121
American Multisystems InfoGold Pentium 60 NT 121
Compaq Deskpro 5/60M 127
Gateway 2000 P5-60 128
HiQ P66 Pentium Graphics Ultra Station 135
IBM ValuePoint P60/D 136
Insight Pro Pentium-EISA 136
MSE Pentium-P 142
Tangent VL-P560 155
UT-Pentium60LB 157

REVIEW CRITERIA

Our requirements for inclusion in this roundup were simple: Any and all Pentium desktop PCs we could find that were actually shipping to customers could participate. We specified a rather high-end configuration, which includes 16MB of RAM, 340MB hard disk, 14-

inch Super VGA video adapter and monitor, keyboard, mouse, DOS, and Windows. To get the most out of the Pentium, vendors typically configure these high-end systems in this manner.

Not surprisingly, list prices varied widely—from about $3,500 for the Gateway 2000 P5-60 to about $8,700 for the Compaq Deskpro 5/60M. And in all fairness to Compaq, its Deskpro, though comparatively expensive, did include many more standard features than did the other units, such as the 20-inch flat screen monitor and Compaq's Business Audio.

When you're comparing computer prices, make sure you're comparing apples with apples and not with oranges. Advanced Logic Research, for example, has gotten a lot of attention with its ads for $2,495 Pentium PCs. Read the fine print, though, and you'll find that these are no more than shell machines. Add a reasonably large hard disk—the $2,495 basic configuration has none—plus a VESA local-bus disk controller with some disk-cache memory, at least 8MB of additional RAM, a video monitor, and a few megabytes of processor-cache memory, and the price levels off at $5,000—about the same as many other machines we reviewed.

Compaq has apparently been watching over ALR's shoulder. After our tests were completed, Compaq announced a similarly stripped machine in its new Deskpro XE line; the unit is priced at just $2,799.

While the build-it-yourself approach is perfect for the more ambitious among us, it is not recommended for all but the most talented of PC amateurs. The sheer number of components available and the complexity of each can make building your own system from scratch a bewildering and daunting task.

Several systems shipped too late to be included in this review, including ones from Austin to Zenon.

PC MAGAZINE

EDITORS' CHOICE

- **ALR Evolution V**

In evaluating the fastest desktop personal computers available, the differences between the best and worst are often subtle and should be placed in the context of what the PC will be used for. A PC built around an excellent motherboard might contain poorly performing components; another might perform well with a graphical interface but crawl under DOS—or vice versa. In our examination of 11 Pentium systems, only one was a flexible all-around system that performed without peer. We give an Editors' Choice award to Advanced Logic Research's ALR Evolution V, but with a strong caveat concerning the company's service record.

BEST ALL-AROUND

The Evolution V is the first product from Advanced Logic Research in recent memory that distinguished itself in terms of both benchmark test scores and features. While it was not the fastest system, it produced consistent, even-handed results across the board. Contrary to what

COMPLICATED CPU

With twice as many transistors as the 486DX2s, and a wide, fast data bus, the Pentium is clearly the most complex PC microprocessor to date, and it has speed to spare. But tapping that speed requires some unique system-board support. In our test machines, we were pleased to see a narrowing of the distance between what's possible and what's actually being delivered. For instance, an external, second-level (L2) processor cache is crucial to fully exploiting Pentium-class speed. Our previous tests have confirmed that 256K is the minimum L2 cache size that delivers good performance, though some vendors have chosen in the past to install fixed-size 128K L2 caches. Part of the good news is that these machines all offer at least 256K. Four systems go a few steps further: The HiQ P66 Pentium Graphics Ultra Station allows cache expansion to 512K; the AcerPower Series 9000, to 1MB; both the Tangent VL-P560 and the UT-Pentium60LB, to a whopping 2MB.

More good news: For the first time, all the tested machines have wide, 64-bit data paths both to processor cache and to main memory. And Compaq's aging but still impressive memory architecture, adapted from the Tri-Flex memory-access design of its servers, allows a 64-bit path to RAM and a 128-bit path to its L2 cache—which is, however, fixed at 256K.

IGNORE THE POSTED LIMITS

If these systems look intriguing, a few words of advice: Don't be confused by the mix of 60-MHz and 66-MHz Pentiums among these machines, and don't waste money by automatically assuming that a 66-MHz machine is going to run faster than a 60-MHz one.

Intel introduced 60-MHz Pentium chips at reduced prices because its yield of chips that worked properly at 66 MHz was very low. By selling the chips that tested perfectly well at 60 MHz but not at 66 MHz, Intel greatly increased the supply of Pentiums and helped vendors get Pentium boxes to market sooner.

You don't have to be an electrical engineer to realize that a 66-MHz Pentium PC should run about 10 percent faster than one using an otherwise identical 60-MHz chip. But solid system design counts for at least as much as operating speed. The AcerPower, for example, is built around a 66-MHz Pentium, and

RECENT REVIEWS

- **Color Goes Mainstream**
  December 21, 1993 ..... *page 191*
  Volume 12 Number 22
- **486 Buyers' Guide**
  December 7, 1993 ..... *page 108*
  Volume 12 Number 21
- **Sight & Sound**
  October 26, 1993 ..... *page 108*
  Volume 12 Number 18

conventional PC wisdom would have us expect, the 60-MHz Evolution V, with its combination of 64- and 128-bit operation, outperformed Acer America Corp.'s 66-MHz AcerPower Series 9000 on the Winstone test (which measures Windows-based application performance) and achieved a higher DOSmark score than did HiQ Computer Systems' 66-MHz HiQ P66 Pentium Graphics Ultra Station. With three ISA and three VLB expansion slots, as well as a total of four drive bays—three of which were filled in our test system—this VESA local-bus system contains more than enough expansion potential for all but a few PC users.

In this test of the fastest PCs available today, it is refreshing to see a cutting-edge PC that is a bargain. A throwback to an earlier era of personal computing, a stripped Evolution V can be had for as little as $2,495, allowing "hands-on" computer users to customize a system suited to their needs. You'd be advised, however, to mirror the *PC Magazine* configuration, which includes a Promise hard disk controller and ATI's VLB Mach32 video chip set, and, at $5,004, is nothing short of an excellent value for the PC user in need of ultimate power.

Our only qualm concerns ALR's dismal showing on our semiannual poll of service and reliability. In our most recent survey of *PC Magazine* subscribers (see our issue of January 11, 1994, for details), ALR dropped from a C to an E—the lowest rating on our Readers' Report Card. Clearly, there is room for improvement and growth in the level of support provided to customers.

WINDOWS-ONLY HONORABLE MENTION

In addition, we praise the HiQ P66 for achieving the highest Winstone score we've ever seen. The Winstone score of 95 means that the appropriately named Ultra Station is about ten times as powerful as the test's reference system, a Compaq 386DX/25. This extra power is due primarily to the HiQ P66's 512K of processor cache, a huge 8MB of hardware cache for the Promise hard disk controller, and the Weitek Power 9000 video chip set. On the other hand, the 66-MHz Pentium system has two weak spots: video and disk performance under DOS. As a Windows-only system, however, the HiQ P66 is without equal.

Acer supports the chip with its own custom-designed motherboard. So this ought to be a screamer, right? Unfortunately, the AcerPower's CPU performance barely outpaced the average of the 60-MHz machines on our tests—and fell well behind that of the one other 66-MHz PC, from HiQ Computer Systems. Raw speed still is no match for careful implementation.

PCI BUS STOP?

Another potential performance-booster we were looking forward to evaluating in these machines is the new PCI (or Peripheral Component Interconnect) bus. Anticipated by many as the likely successor to the VESA (Video Electronics Standards Association) VL-Bus in the quest to remove the most performance-dependent components from the slow AT expansion buses, PCI appears in this roundup's Gateway, IBM, and MS Engineering machines. (For an in-depth look at PCI, see our issue of November 9, 1993.)

As a group, these PCI-equipped systems performed about as well as comparable VL-Bus PCs. For instance, MS Engineering's PCI-based system and Unitek Technology's VL-Bus–based system both use the Weitek Power 9000 video chip, and both achieved roughly the same level of performance on our Graphics WinMark tests—12.4 and 13.6 million pixels per second, respectively.

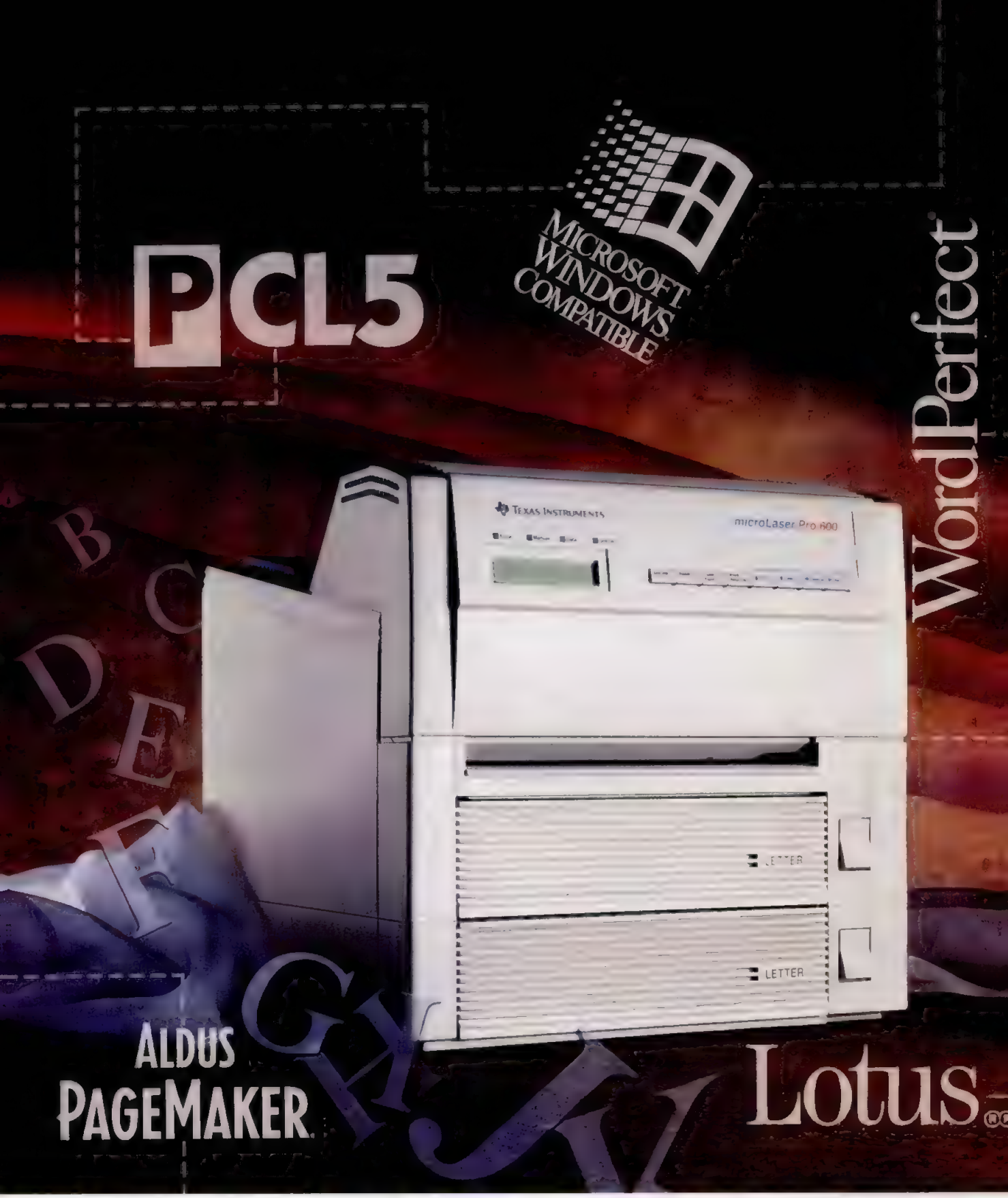
Solid system design counts for at least as much as operating speed when dealing with Pentium PCs.

This is likely the result of some design choices in the first round of PCI. While PCI allows the processor and memory to operate independently of the system's bus, this is a step short of true processor independence. The whole idea of a processor-independent bus, such as PCI, is to allow connected peripherals (video cards and hard disks, for example) to run at very fast speeds, not at the creaky old 8-MHz expansion-bus speed introduced with IBM's PC-AT in 1984. But the PCI bus is hardly CPU-independent: It runs at a speed that is the fixed divisor of the CPU's clock, and it requires buffering of data at every stage.

Thus 66-MHz Pentiums run a PCI bus at 33 MHz; 60-MHz machines run PCI buses at 30 MHz. A big improvement over 8 MHz, yes, but hardly processor independent, and perhaps not as capable of truly speeding up system performance as we'd hoped. The Intel PCI chip set design used by Gateway, IBM, and MSE also doesn't yet support write-back caching to external cache, so systems must use the less efficient write-through caching scheme. That problem probably will be solved sometime in 1994, with a redesign of Intel's PCI controller chip set.

Compaq went its own way, with a proprietary bus design to speed up the performance of its QVision video card. There were other systems that stood out in terms of video performance as well. One was the American Multisystems InfoGold Pentium 60 NT, which uses the same motherboard as the ALR Evolution V. All similarities between the two systems,

Our Contributors: JIM SEYMOUR is a contributing editor of *PC Magazine*. CAROL VENEZIA is a staff editor for *PC Magazine*. OLIVER RIST is a staff writer and ANUSH YEGYAZARIAN is a senior editorial researcher at *PC Magazine*. WILLIAM P. FLANAGAN and AMARENDRA SINGH are technical analysts at PC Magazine Labs. BRIAN NADEL was the associate editor in charge of this story, and TAMI PETERSON was the project leader.



PC MAGAZINE EDITORS' CHOICE

*Specifications in chart are based on information as of 11/93. *Estimated dealer price including manufacturer's rebate is under $1400. Dealer prices may vary. †@ 4% coverage. ** Rebate applies to PS25 model. Software products illustrated above are not included with printer, and are intended only to indicate compatibility. microLaser and "Extending Your Reach With Innovation" are trademarks of Texas Instruments. Adobe PostScript and the PostScript logo are registered trademarks of Adobe Systems, Inc. WordPerfect is a registered trademark of WordPerfect Corporation. PageMaker is a registered trademark of Aldus Corporation. Lotus is a registered trademark of Lotus Corp. The Microsoft Windows logo is a registered trademark of Microsoft Corporation. Mac is a registered trademark of Apple Computer, Inc. LaserJet is a registered trademark of Hewlett Packard, Inc. © 1993 TI*

TI Redefines What You Should Expect From An Office Printer.

New TI microLaser™ Pro 600

When we set out to design the ideal laser printer, we began by asking thousands of users what they wanted most. And then, instead of making those "key care-abouts" optional, as others do, we made them standard.

Take print quality. We began with true 600 dpi resolution. And then enhanced it with 6MB of memory for improved graphics. Compatibility? We're DOS, Windows and Mac® compatible right out of the box. With all the right languages and interfaces. And with the intelligence to switch these automatically, depending on the environment. Low maintenance? Our new toner cartridge typically gives you 15,000 pages between changes. Paper handling? Two 250-sheet trays come standard. And finally, value. As the chart below shows, not only do we give you a lot more than our leading competitor, we also charge you a lot less.

So if you're considering a new printer, we invite you to try the new TI microLaser Pro 600. We're so confident you'll like it, we'll even give you a 30-day satisfaction guarantee. For more information or a dealer near you, call *1-800-527-3500*.

Ask About Our $60 End User Rebate.††

	TI microLaser Pro 600	HP LaserJet® 4	HP LaserJet 4M
True 600 dpi	Yes	Yes	Yes
Memory	6MB	2MB	6MB
Emulations	PCL5/Adobe® PostScript® 2	PCL5E	PCL5E/Adobe PostScript 2
Compatibility	DOS/Mac	DOS	DOS/Mac
Toner Cart. Life	15K pages†	6K pages	6K pages
Paper Trays	250 sheet/250 sheet	250 sheet/100 sheet	250 sheet/100 sheet
Auto Language Switching	Yes	No	Yes
Auto Interface Switching	Yes	Yes	Yes
40MHz Processor Upgrade	Optional	Not Avail.	Not Avail.
List Price	$1599*	$1839	$2479

EXTENDING YOUR REACH WITH INNOVATION™

TEXAS INSTRUMENTS

CIRCLE 353 ON READER SERVICE CARD

HIGHLIGHTS

Pentium PCs

THE NEED FOR SPEED is shown by the 11 Pentium PCs tested. As a group, these machines outperform 486DX2/66s by about 80 percent.

PENTIUM'S SECOND COMING. The first wave of Pentium PCs was made up of a few expensive machines that were hard to justify buying in light of the performance edge they offered. We are now in the midst of the second wave—more systems that perform better and are more aggressively priced. Expect a third wave this spring that will lower prices and introduce more true-Pentium system designs.

PRICES RANGE from a low of $3,595—for the Gateway 2000 P5-60—to a high of $8,758—for the Compaq Deskpro 5/60M. And while Advanced Logic Research and Compaq are offering some models at prices below $3,000, these systems are stripped. For a fully configured system, the price rises to about $5,000.

CACHE COUNTS HERE, with 256K of external cache being the minimum for acceptable performance. If your applications are more intense, look at machines that offer more cache: The AcerPower Series 9000 offers up to 1MB; both the Tangent VL-P560 and the UT-Pentium60LB offer up to 2MB.

60- OR 66-MHZ, it doesn't matter. A well-designed 60-MHz Pentium system can easily outperform a nonoptimized PC that is based on the more expensive 66-MHz part.

EXPECT MORE CHOICES, with Intel bringing out a flurry of new chips in the near future. Later this year, expect a 100-MHz clock-tripled 486 CPU and others from Intel.

PENTIUM ALTERNATIVES, such as IBM's Blue Lightning, offer a more cost-competitive approach to high-end processing power. These however, don't stack up well against Pentium in terms of computing ability.

DIGITAL offers a unique approach in a system that can operate as a Pentium PC or as an Alpha RISC workstation.

HOT STUFF is the only way to describe Pentium systems. All require heat sinks of varying sizes and shapes. Some use a fan to keep the chip cool.

MANY PENTIUM SYSTEMS are niche fillers, excelling in one area or another. Only the ALR Evolution V turned in high-end performance scores under both DOS and Windows. The HiQ P66 Pentium Graphics Ultra Station was the hands-down choice for Windows-only operation.

PCI makes its debut here in three systems—the Gateway P5-60, the IBM ValuePoint P60/D, and the MSE Pentium-P. Early design glitches limit performance to about the level of VESA's VL-Bus.

however, end there. While ALR engineers were able to resolve the conflict between DOS performance and Windows performance, American Multisystems was not. For example, ALR uses the ATI VLB Mach32 video card and scored above average on our video tests under both DOS and Windows. AMS chose to go with a Matrox MGA Ultima VL card and placed second to last on DOS video tests but made a good showing on our Graphics WinMark tests.

The HiQ P66 stood out in terms of Windows performance, garnering a top score on the Winstone benchmark test, which evaluates Windows applications speed. But as good as the HiQ P66 was at Windows tasks, it lagged under DOS. The AcerPower scored highest in the group on disk performance under DOS, second-highest under Windows. The Compaq Deskpro 5/60M, the Gateway 2000 P5-60, and the IBM ValuePoint P60/D all excelled on DOS video tests. But although these systems performed well on those specific tests, only the ALR Evolution V produced good performance scores across the board.

BUT MAYBE. . .BUT MAYBE. . .

As good as these machines are, if their designs are still based on those of the 486s, some readers inevitably will wonder if keeping their existing 486 PCs and dropping a Pentium upgrade chip into the ZIF socket isn't a better choice than trading their machines for one of the 11 tested here. It's an intriguing dilemma.

As well as these Pentium systems performed, only the ALR Evolution V produced good performance scores across the board.

It's been an article of faith, and often a major selling point, among many PC makers over the past year and a half that their 486 boxes would be cheaply and easily upgraded to Pentium power with Intel's forthcoming P24T chip. An upgrade-only CPU, the P24T was supposed to appear this year, and it promised to make our lives easier—and faster. Unfortunately, you still can't buy a P24T, and it's not yet certain when you will be able to. Nor can you know whether the chip will work properly in your 486 PC. The problem is the heat that this chip generates. Although the long-term direction in the microprocessor industry is toward 3.3-volt CPUs that use less power and radiate less heat, the P24T chip (like the Pentium) is still a 5-volt design.

When Intel began testing its first sample P24Ts last summer, and then began examining some of its vendors' existing "Pentium-ready" 486 machines, it found

Suitability to Task: Pentium PCs

The majority of the 11 Pentium PCs reviewed scored *good* or *excellent* in at least one Suitability to Task category, showing that they are all high-end workstations.

The **DOS applications** score reflects a system's ability to run DOS software quickly and efficiently. Excellent systems are those that earned top DOSmark scores on our benchmark tests.

Windows applications is a more demanding category; the rating indicates how well a system will operate Windows software. This score takes into account system hardware and benchmark test results, including Graphics WinMark and Disk WinMark benchmark-test scores and the score each system earned on our new test, Winstone 94, Version 1.0.

We also give weight to the hardware factors germane to a system's design. For instance, the maximum RAM a system allows (either on the motherboard or through a proprietary add-in card) is especially important not only for current Windows use but down the line as well—particularly if Windows NT is in your business's long-term productivity picture. Finally, we take into account a system's hard disk options and the diagonal size of its monitor; with Windows, the bigger the better.

Those systems with excellent ratings in this category posted stellar processor scores on our benchmark tests and contained top-flight video controllers and fast hard disks, as evidenced by their excellent Graphics WinMark and Disk WinMark scores. Fewer systems garnered excellent ratings in this category than in our DOS applications category. But this reflects reality, as fewer systems perform as well under Windows as they do under DOS

▶ Product Name	
SUITABILITY TO TASK	
DOS applications	FAIR
Windows applications	GOOD
Expandability	EXCELLENT
VENDOR SERVICE & RELIABILITY	
Reliability	BELOW AVERAGE
Repair service	AVERAGE
Technical support	ABOVE AVERAGE

Expandability refers to a system's potential for growth. Considerations include ease of processor and external cache upgrades, system BIOS, hard disk options, maximum RAM installable on the motherboard and via expansion cards, available drive bays and bus slots, the presence of a flash-upgradable BIOS system, and the presence of a 16550 UART high-speed serial-port chip. The best systems have drive bays and slots to spare and easily upgradable processor/cache subsystems.

With so many factors involved, it is not at all surprising that those systems with excellent ratings in this category are not just towering cases but robust models designed with multiple users in mind.

SERVICE AND RELIABILITY

In our 1994 Service and Reliability Survey, we sent questionnaires to 17,000 subscribers; about half replied. Vendors for whom we received at least 50 responses are rated *above average, average,* or *below average* in three areas

Reliability scores indicate to what degree PC owners felt their systems met their overall expectations for consistent operation.

Repair service scores are culled from users who contacted the vendors to have their PCs repaired.

Technical support scores measure how well vendors' telephone support met respondents' expectations.

that those toasty P24Ts could cause problems in poorly designed cases. Intel modestly redesigned P24Ts to run cooler, but they'll still be 5-volt chips and therefore inherently hotter than a comparable 3.3-volt chip.

One solution has been to produce a variety of Pentium-upgrade chips for 486s. One chip, with a 238-pin design, will fit into the upgrade socket and, Intel assures us, will run just fine with a heat sink. Intel will also specify a heat sink/fan on other 238-pin chips. Another chip, with a 237-pin design, will yield roughly a 70 percent performance improvement for 486 owners, Intel says, but will include a special active heat sink/fan mounted atop the chip to assure satisfactory cooling. To cool any fears of meltdown, Intel will test systems and certify them as being able to handle any of the P24T variants.

So should you buy a Pentium PC now or wait until sometime in 1994 to buy a P24T-style Pentium upgrade for the late-model 486DX2 you own now? If you wait and go for the upgrade, don't expect to see performance that matches today's 60-MHz and 66-MHz Pentiums. For one thing, the P24T will be a Pentium-style 64-bit design internally; it will communicate with the outside world via a 32-bit external data bus. In addition, it's likely to be a clock-doubled design (like the DX2s), running at 66 MHz internally but just 33 MHz externally. By contrast, the machines tested in this roundup show about an 80 percent improvement over comparable 486DX2/66s; Intel posits a 70 percent improvement over 486DX2/66 performance with the P24T-upgrade chip.

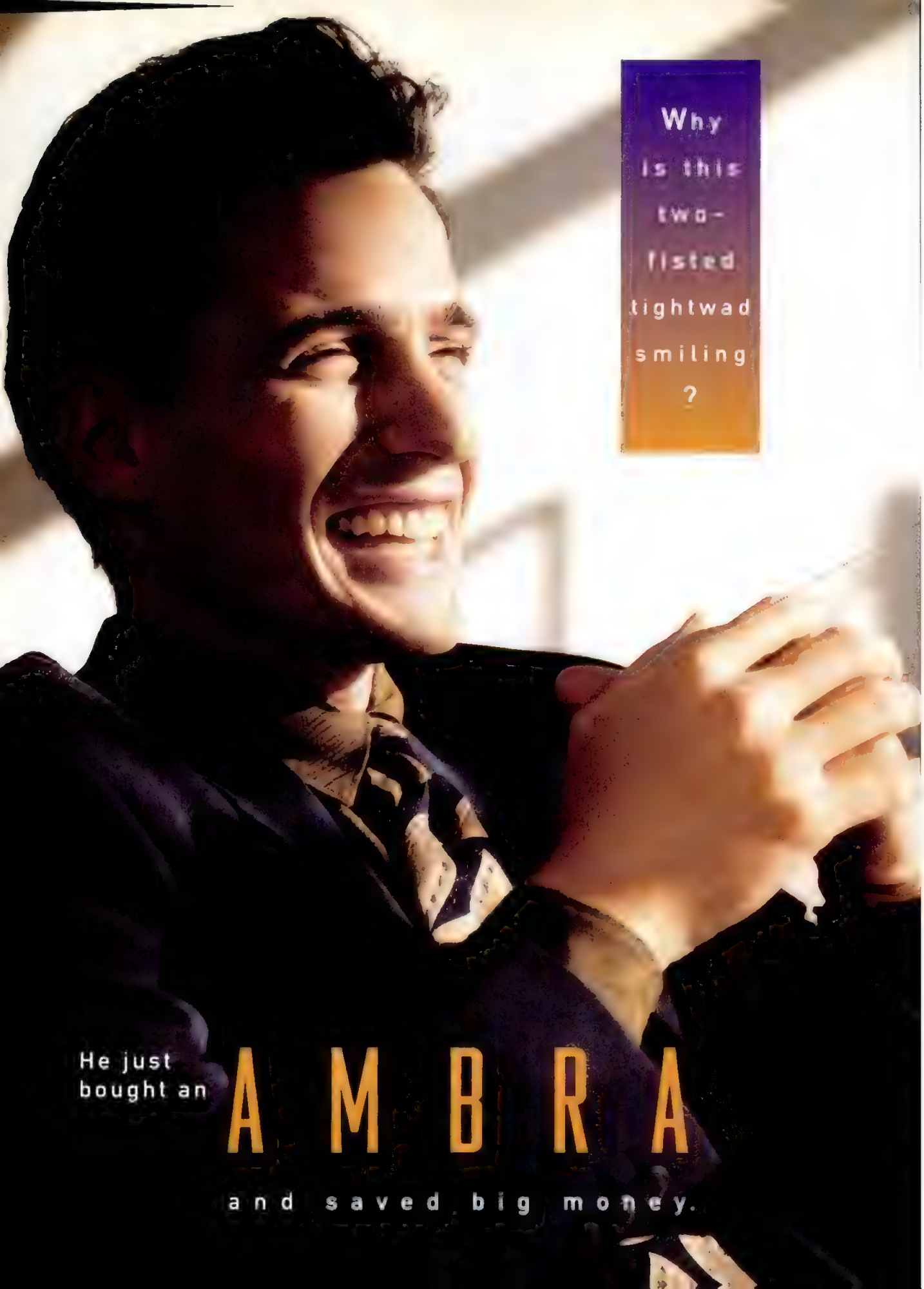
To cool any fears of PC meltdown, Intel plans to certify systems as being able to handle any of the P24T processor variants.

Those numbers seem pretty accurate. But our guess is that in reality, buyers will find a larger performance gap between the Pentium machines and the upgraded DX2/66s. So if you really want the most bang for the buck, you're better off buying a Pentium PC now.

486 AND A HALF

We hate to make things even more complicated, but it wouldn't be fair to discount other options. Sometime in early 1994, Intel will start shipping its so-called DX3s, which do clock doubling one better by running internally three times as fast as they do externally. IBM started the triple-is-better-than-double proposition with its Blue Lightning CPUs, but these 25-/75-MHz processors have been anything but high-end. (For more information, see the sidebar "Alternatives to the Pentium.")

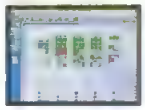
It's our guess that Intel's clock-tripled 100-MHz 486DX3s will perform about as


Why is this two-fisted tightwad smiling?
He just bought an
AMBRA
and saved big money.

NOTEBOOKS

LIGHTWEIGHT

MODEL SN425C



- 486SX, 25 MHz, SL-Enhanced
- 4MB RAM
- 170MB hard disk
- 7.8" STN color screen
- 1 PCMCIA slot, Type II
- Parallel and serial ports; external keyboard, monitor and diskette drive ports
- 86-key keyboard
- Integrated 16mm trackball
- Suspend/Resume
- NiCad battery
- MS-DOS® 6.0, Windows™ 3.1
- 4 lbs, including battery

$1,899

(Monochrome models available at $1,399. With external 3.5" 1.44MB diskette drive, add $99.)

NOTEBOOKS!

MODEL N450C

- 486DX2, 50 MHz
- 4MB RAM
- 3.5" 1.44MB diskette drive
- 200MB hard disk
- 9.5" STN dual-scan color screen
- 1 PCMCIA slot, Type III
- Parallel and serial ports; external keyboard and monitor ports
- 86-key keyboard
- Integrated 16mm trackball
- Suspend/Resume
- NiCad battery
- MS-DOS 6.0, Windows 3.1
- 6.6 lbs, including battery

$2,699

For HOT computers at hold-onto-your-cash prices, call AMBRA.™ You CAN have it all!

BLUE LIGHTNING

MODEL D466BL

- 486 Blue Lightning,™ 66 MHz
- Upgradeable to Intel® Pentium™ technology
- 4MB RAM
- 256KB processor cache
- 3.5" 1.44MB diskette drive
- 340MB hard disk
- Onboard SCSI
- 5 16-bit ISA slots (2 VESA on local bus)
- Windows accelerator, 1MB video memory
- 15" Flat Square color monitor, LR, NI
- Network-ready (Ethernet 10BaseT)
- MS-DOS 6.0, Windows 3.1, mouse

$1,895

(For 8 x 6 minitower, add $75.)

MODEL S450DX

limited

- 486DX2, 50 MHz
- 4MB RAM
- 128KB processor cache
- 3.5" 1.44MB diskette drive
- 340MB hard disk
- 3 ISA slots (2 VESA on local bus)
- 3 storage bays
- Windows accelerator, 1MB video memory
- 14" SVGA color monitor, LR
- MS-DOS 6.0, Windows 3.1, mouse

$1,699

DESKTOPS

Model D466DX

- 486DX2, 66 MHz
- 8MB RAM
- 256KB processor cache
- 3.5" 1.44MB diskette drive
- 340MB hard disk
- 8 ISA slots
- 6 storage bays
- Windows accelerator, 1MB video memory
- 2X CD-ROM drive
- 15" Flat Square color monitor, LR, NI
- MS-DOS 6.0, Windows 3.1, mouse

$2,495

Pentium technology

MODEL DP60/PCI

- INTEL PENTIUM PROCESSOR, 60 MHZ
- 64-BIT DATA PATH
- 8MB RAM
- 256KB PROCESSOR CACHE
- 3.5" 1.44MB DISKETTE DRIVE
- 340MB HARD DISK
- 4 ISA, 2 PCI, 1 PCI/ISA SLOT
- 6 STORAGE BAYS
- PCI GRAPHICS ACCELERATOR, 2MB DRAM
- 14" SVGA COLOR MONITOR, LR
- MS-DOS 6.0, WINDOWS 3.1, MOUSE

$2,799

Free customization. AMBRA custom-configures to your exact specs — with no extra service charge and no delay.

More systems to choose among! Call soon!

Firm confidence. Every AMBRA comes with a 30-day money-back guarantee and a one-year limited warranty. An optional IBM® one-year onsite warranty is also available.[1] With either warranty, you can rely on toll-free technical support around the clock.

Full convenience. To place an order or get more information, just call any weekday 8 am to 9 pm, or Saturday 10 am to 6 pm (ET). We accept Visa,® MasterCard® and American Express® — as well as purchase orders from qualifying businesses. Pick up the phone today!

AMBRA

In Canada[2] call 1-800-363-0066 Ext. 5416

1-800-239-5416

[1] Please call for details regarding AMBRA's money-back guarantee and limited warranty, and IBM onsite warranty. Return shipping and insurance charges are the responsibility of the customer. Onsite service may not be available in certain locations.
[2] Offerings may differ in Canada.

© 1993 AMBRA Computer Corporation. AMBRA is a trademark of ICPI Ltd. and used under license therefrom. The AMBRA logo and logotype are trademarks of AMBRA Computer Corporation. IBM is a registered trademark and Blue Lightning is a trademark of International Business Machines Corporation. MS-DOS is a registered trademark and Windows is a trademark of Microsoft Corporation. Intel is a registered trademark and Pentium is a trademark of Intel Corporation. All other product names are trademarks or registered trademarks of their respective suppliers. Offerings, prices and products are subject to change without prior notice. Prices do not include shipping.

well as the Pentium PCs tested here—with one exception. One of Pentium's strengths is its substantially improved floating-point math performance, which makes a noticeable difference in the speed of sophisticated software such as CAD programs. The DX2 line, and likely the DX3 line as well, use an older variant of floating point hardware.

Even so, with an expected cost that will fall between the prices of Intel's DX2/66 and Pentium, the DX3s (or whatever Intel calls these chips) may be better choices for those who need more power than current DX2/66 designs offer but aren't yet ready to ante up for a Pentium machine.

TOUGH CHOICES

This then is our second foray into the sometimes strange world of Pentium PCs. The 11 machines reviewed on the following pages are generally better engineered and more affordable than those we found in our first exploration of Pentiums half a year ago. They are also, on the average, somewhat faster. If you don't find what you're looking for here, keep reading: Later this year, we'll put together another installment of the long-running "Who's Got Pentium" soap opera.

Acer America Corp.

AcerPower Series 9000

Acer America Corp. built its 66-MHz Pentium system—the $5,550 AcerPower Series 9000—around a proprietary motherboard design that utilizes a combination of EISA and VESA local-bus architecture. But even with the advantage of a 66-MHz Pentium and local-bus architecture, the AcerPower was able to produce only midrange performance scores.

Acer packaged the AcerPower Series

The Heat Is On: *Cooling the Pentium*

by Carol Venezia

Part and parcel of the Pentium's prodigious computational abilities is the amount of heat it produces while churning through all those bits and bytes. With this design, Intel has single-handedly opened up a new area for system engineers to contend with: keeping the chip cool enough that it doesn't burn out.

In this era of high-powered CPUs, thermal design counts for at least as much as electronic sophistication.

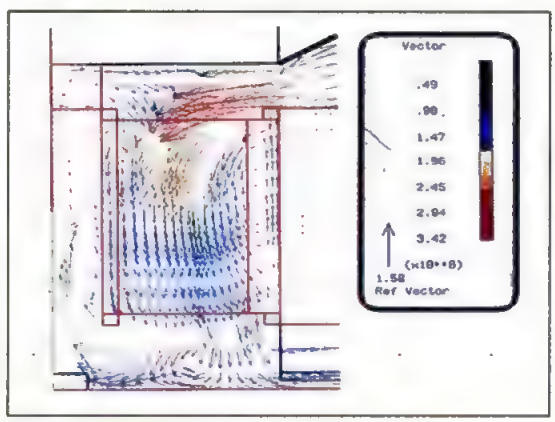
WATTS THE PROBLEM?

Operating at full throttle, a 66-MHz Pentium uses 16 watts of power, although typical usage is closer to 13 watts; a 60-MHz Pentium chip uses about 8.5 percent less power. By contrast, the 486DX2/66 processor uses just 6 watts of power on the average. Add to this the fact that the Pentium has 3.1 million transistors, as compared with the 1.3 million of Intel's 486 family, and you have the potential for a rather steamy situation.

The Pentium chip, however, ships as is, without so much as a heat sink or fan attached. The reason? According to Chris Lane, Technical Marketing Manager for Intel's Pentium Processor Group, "We could put a heat sink on every Pentium processor, but everyone's box is different. And they [the vendors] know better than we do how they want their systems designed."

BETTER DESIGN? IT'S IN THERE

Producing the most efficient heat-flow pattern usually starts with software modeling. One of the most advanced software packages available is made by Flomerics of Westboro, Massachusetts (508-366-9522), which uses computational fluid dynamics. Called FLOtherm, the program allows designers to build a three-dimensional model of their computers—including circuits, boards, fans, vents, filters, and power supplies—and factor in environmental conditions such as temperature, gravity, and such intangibles as sunlight. FLOtherm then generates a diagram of the system, based on each component's power usage and geometric information. The result is a diagram showing the velocity of air flow and the system temperature throughout the case.



With FLOtherm, designers can generate a diagram showing the velocity of airflow inside a computer case.

Using this software, the designer can reposition or change components on a computer-generated model first, before any metal or plastic is actually cut.

SINKS, FANS AND SUCH

In response to the heated uproar over Pentium, each computer maker has devised its own method of keeping the chip cool. Some use large aluminum heat sinks; others place a fan or two right on the CPU. Some have taken the belt-and-suspenders approach of relying on both a heat sink and a fan.

PC Power & Cooling, a company in Carlsbad, California (800-722-6555), offers the Penta-Cool, a ZIF-compatible heat sink/fan combination with a twist: If the fan stops spinning, an alarm will sound to alert the user. Another approach is taken by T.S. Microtech, which is based in Torrance, California. T.S. Microtech markets the FanCard II, an expansion card with two fans that fits into any 8-, 16-, or 32-bit slot; these fans blow cooling air in two directions to

9000 in its standard desktop case with a 15-inch AcerView 56L monitor that has digital controls and up to 16 user-defined presets. Inside the case, you'll find Acer's own motherboard, five drive bays (two left empty), a Diamond Viper VLB video card that uses the Weitek Power 9000 video chip with 2MB of video RAM, and a 200-watt power supply.

The AcerPower Series 9000 carries six EISA slots and two VL-Bus slots, and it handles up to 128MB of on-board RAM. Both the Pentium processor and its external RAM cache (of between 512K and 1MB) are carried on the same easily upgradable processor card in case you want to upgrade to the fabled 100-MHz Pentium chips of tomorrow. Acer also included dual-channel, on-board SCSI-2 (connected to the 520MB Fujitsu hard disk in our test system) and touts its ability to hook up to 14 devices. The external SCSI port was not connected on our test system, but Acer says that shipping systems will come with it connected.

AcerPower Series 9000

SUITABILITY TO TASK	
DOS applications	GOOD
Windows applications	GOOD
Expandability	EXCELLENT
VENDOR SERVICE & RELIABILITY	
Reliability	AVERAGE
Repair service	AVERAGE
Technical support	BELOW AVERAGE

eliminate pockets of dead airflow, where heat can build up.

NOW HOT IS THE FUTURE?

As if Pentium's 16-watt peak-power consumption weren't bad enough, Jerry Rogich of Digital Equipment Corporation's PC Product Management & Development team has to deal with Digital's 200-MHz Alpha processor, which consumes 30 watts. "Solid system design is everything," says Rogich. "If we can build a system with Digital's Alpha processor, then Pentium is no problem."

Digital has engineered its DECpc XL family, which can accommodate a 486, Pentium, or Alpha CPU. The key to cooling the DECpc XLs is a gray plastic funnel that looks more like a vacuum cleaner attachment than it does a PC part. It is used to direct cooling air across the chip's face.

If the past is any indication of the future, chip designers will continue to push the speed envelope. Intel is already planning the next two generations of the Pentium, code-named P6 and P7, which will likely operate at higher clock speeds than does the Pentium's 66-MHz chip, producing even more heat. And although lower-voltage designs, smaller chip sizes, and more tightly integrated packages will help relieve the problem, total system design will ultimately be the key to success. □

NOT QUITE UP TO SPEED

While Acer's motherboard supports full 64-bit paths to main memory and processor cache, the test scores didn't reflect this. Performance was a little disappointing if you consider that this unit uses the hard-to-get 66-MHz chip. The AcerPower's processor performance tied that of the 60-MHz performers in this roundup and this unit was markedly slower than the one other 66-MHz entry from HiQ Computer Systems. The AcerPower's video score was well below average under DOS but slightly above average under Windows—a result of the Diamond Viper VLB's use of the Windows-intensive Weitek Power 9000 chip.

Disk scores were the only performance highlight for this unit, which placed first on DOS disk tests and second on Disk WinMark tests using the 520MB Fujitsu hard disk. The AcerPower's decent DOSmark score was attributable mainly to the strong DOS disk score, but the unit's Winstone score, though just about average for the group, was far lower than that of the HiQ entry.

Acer will configure this high-end workstation to users' specifications, but it doesn't offer the wide variety of configurations that some vendors reviewed here do. Monitor size is limited to 17 inches right now. Acer will be offering Windows NT systems that feature CD-ROM drives (from Sony or Mitsumi) and include a graphics accelerator card.

Acer sells direct as well as through resellers and VARs. The company includes a relatively standard one-year parts-and-labor warranty with free on-site service and 24-hour, toll-free technical support.—*Oliver Rist*

FACT FILE

AcerPower Series 9000
Acer America Corp., 800-368-2237, 408-432-6200

List price (tested configuration): $5,550
Memory and processor RAM cache: 16MB 70-ns SIMMs, 512K external cache
Disk drives and controller: Fujitsu M2691ESA 12-ms 520MB SCSI-2 hard disk with 256K cache, 1.2MB and 1.44MB floppy disk drives, integrated disk controller
Display: Diamond Viper VLB VESA local-bus-card video controller with 2MB video RAM, Acer AcerView 56L 15-inch monitor with a 72-Hz refresh rate at 1,024-by-768
Software: DOS 6.0, Microsoft Windows 3.1
In short: Though carrying a 66-MHz processor and a combination of VESA and EISA local-bus architectures, the AcerPower Series 9000 costs more than most Pentiums in this roundup and didn't stand out on *PC Magazine*'s benchmark tests
441 ON READER SERVICE CARD

Advanced Logic Research Inc.

ALR Evolution V

American Multisystems

American Multisystems InfoGold Pentium 60 NT

Though they look vastly different, the $5,004 ALR Evolution V from Advanced Logic Research and the $4,999 American Multisystems InfoGold Pentium 60 NT share the same heart: Advanced Logic Research's proprietary Evolution V

motherboard. But these systems' different configurations and components show that a complete PC system is more than a good motherboard. Selection and implementation of components also adds to a system's quality. In these areas, Advanced Logic Research clearly overshadows American Multisystems.

American Multisystems is an unauthorized user of Advanced Logic Research's motherboard, and we are unsure which other components American Multisystems will be using in the future. Not surprisingly, ALR's implementation of its own board was noticeably better than American Multisystems' board implementation.

Both systems had over 500MB of mass storage and used VL-Bus graphics and disk controllers. But while Advanced Logic Research's Evolution used a 4MB cache, American Multisystems' InfoGold used a BusLogic controller with no cache, relying instead on a Maxtor hard disk's built-in 256K cache. Disk performance and most other benchmark test scores for the two machines were close and just about average, except on DOS-based video tests, where the two units diverged: The InfoGold's Matrox video controller was outperformed by the Evolution's ATI VLB Mach32, putting the InfoGold just ahead of the last-place Tangent VL-P560. The DOSmark and Winstone benchmark test scores decidedly favored the Evolution as well.

ALR Evolution V

SUITABILITY TO TASK	
DOS applications	EXCELLENT
Windows applications	EXCELLENT
Expandability	GOOD
VENDOR SERVICE & RELIABILITY	
Reliability	BELOW AVERAGE
Repair service	BELOW AVERAGE
Technical support	BELOW AVERAGE

UNOFFICIALLY—A GOOD CHOICE

American Multisystems managed to get a number of ALR motherboards, although there is no official agreement between the two companies. It is also unclear how long American Multisystems will be using this motherboard. But American Multisystems' use of the ALR motherboard, though not sanctioned by ALR, was a good one. Unlike the motherboard of the ALR ProVEISA Pentium machine we saw earlier in the year, the Evolution's motherboard handles a 64-bit path to the InfoGold's 256K external cache and to the unit's system memory (with an onboard maximum of 128MB).

AMS InfoGold Pentium 60 NT

SUITABILITY TO TASK	
DOS applications	FAIR
Windows applications	EXCELLENT
Expandability	EXCELLENT

The motherboard also carries six ISA slots—three with VESA local-bus extensions. In addition, the board has a removable clock crystal that should allow upgradability to the 66-MHz version when it appears in volume.

The Evolution comes in a standard desktop case that loses to the InfoGold tower unit only in terms of the number of available drive bays: One is left open on the Evolution, four on the InfoGold. Both systems come equipped with dedicated fans to cool the processors, and both companies offer higher-end systems, which include larger monitors and installed multimedia kits. Documentation for the Evolution included clearly and coherently written manuals and was definitely better than documentation for the InfoGold. Neither company shipped a satisfactory high-end monitor; both were standard, low-end, 14-inch displays.

The standard warranty is another area where Advanced Logic Research beats American Multisystems hands down: ALR's Evolution comes with a five-year-parts, 15-month-labor warranty; American Multisystems offers a standard one-year parts-and-labor warranty. In addition, ALR offers first-year onsite service for a nominal price of $9.95, while American Multisystems doesn't offer it at all.—*OR*

FACT FILE

EDITORS' CHOICE

ALR Evolution V
Advanced Logic Research Inc., 800-444-4257, 714-581-6770

List price (tested configuration): $5,004
Memory and processor RAM cache: 16MB 70-ns SIMMs, 256K external cache.
Disk drives and controller: Maxtor MXT-540A 13-ms 535MB IDE hard disk with 64K cache, 1.2MB and 1.44MB floppy disk drives, Promise DC-4030VL VESA local-bus disk controller with 4MB cache
Display: ATI VLB Mach32 VESA local-bus-card video controller with 2MB VRAM, ALR FlexVIEW 3X NI 14-inch monitor with a 60-Hz refresh rate at 1,024-by-768
Software: DOS 6.0, Microsoft Windows 3.1
In short: Advanced Logic Research's ALR Evolution V is a high-end desktop workstation that could use a slight upgrade in the display department. This system, however, produced the best mix of performance and features among this high-flying group of PCs

442 ON READER SERVICE CARD

FACT FILE

InfoGold Pentium 60 NT
American Multisystems, 800-888-6615, 408-524-9091

List price (tested configuration): $4,999
Memory and processor RAM cache: 32MB 70-ns SIMMs, 256K external cache
Disk drives and controller: Maxtor MXT-540SL 13-ms 540MB SCSI-2 hard disk with 256K cache, 1.2MB and 1.44MB floppy disk drives, BusLogic BT-445S VESA local-bus-card disk controller
Display: Matrox MGA Ultima VL VESA local-bus-card video controller with 2MB VRAM, AMS IG3000 14-inch monitor with a 72-Hz refresh rate at 1,024-by-768
Software: DOS 6.0, Microsoft Windows 3.1.
In short: American Multisystems' InfoGold Pentium 60 NT is based on Advanced Logic Research's Evolution motherboard. Despite the advantage of a slightly lower price tag, however, the InfoGold system couldn't quite hold its own

443 ON READER SERVICE CARD

MICRON PENTIUM™ POWER!

MICRON
SEMICONDUCTORS TO SYSTEMS
15 YEARS STRONG

PENTIUMS FOR

P60PCI MAGNUM CD

- Intel™ Pentium 60MHz Processor
- 16MB RAM, upgradeable to 128MB
- 527MB 10ms SCSI-2 Hard Drive
- PCI Fast SCSI-2 Controller (up to 7 devices)
- 256K 15ns write-back cache
- 1MB Flash BIOS by Phoenix
- 8 slots: 3 PCI, 5 ISA
- 2 on-board 16550-compatible serial ports
- 1 on-board bi-directional parallel port
- Double speed CD-ROM drive
- 3.5" floppy drive standard
- Diamond Viper PCI (2MB VRAM)
- 15" Micron 15FG, 1280NI, .28mm, MPRII
- Tower chassis with 8 drive bays
- 300 Watt power supply
- Microsoft® Mouse, 101-key keyboard
- Choice of application software

$3,799 LEASE - $132/MO.

P60PCI PLATINUM CD

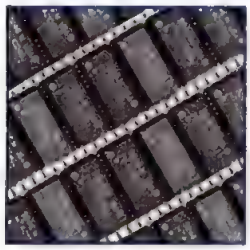
- Intel Pentium 60MHz Processor
- 64MB RAM upgradeable to 128MB
- 2.0GB 9ms SCSI-2 Hard Drive
- PCI Fast SCSI-2 Controller
- 256K 15ns write-back cache
- 1MB Flash BIOS by Phoenix
- 8 expansion slots: 3 PCI, 5 ISA
- 2 on-board 16550-compatible serial ports
- 1 on-board bi-directional parallel port
- Double speed CD-ROM drive
- 3.5" floppy drive standard
- Diamond Viper PCI (2MB VRAM)
- 17" Micron 17FGx, 1280NI, .26mm, MPRII
- Tower chassis with 8 drive bays
- 300 Watt power supply
- Microsoft Mouse, 101-key keyboard
- Choice of application software

$6,799 LEASE - $236/MO.

intel inside pentium

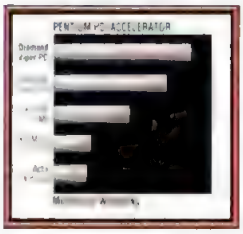
PCI FAST SCSI-2 AND 64MB RAM

MICRON MEANS MORE MEMORY



Over the past 15 years Micron has gained worldwide recognition as a leading memory manufacturer. Micron gives you the power you'll need for tomorrow's memory intensive applications today. Micron also have the 16MB, 32MB and 64MB upgrades you'll need—*at factory direct prices!*

DIAMOND VIPER ACCELERATOR

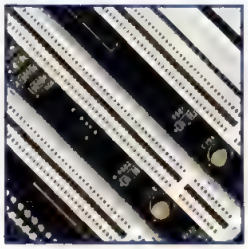


Powered by the Weitek P9000, the Diamond Viper PCI runs at almost twice the speed of the ATI PCI graphic accelerator. With 2MB of VRAM, you'll get 256 colors at 1280 x 1024 @ 75Hz and 16.7 million colors at 800 x 600. Turbo Windows and SoftEngine AutoCAD drivers included.

PENTIUMS FOR POWER USERS

Intel's new Pentium™ microprocessor is a power user's dream! Its 64-bit data path and superscalar operation give you consistently superior performance, whether your system is designed as a network server or a workstation.

MICRON PCI SUB-SYSTEMS



- PCI Local Bus IDE controller
- PCI Local Bus IDE caching controller with 4MB standard (upgradeable to 16MB)
- PCI Local Bus Fast SCSI-2 controller

POWER USERS

4 YEAR ON-SITE WARRANTY

Protect your new Micron system with one of the most respected names in America -- General Electric! This new optional four-year warranty provides on-site service, parts and labor on your entire system, including the monitor. Ask your Micron representative for details.

CHOOSE ONE AT NO CHARGE . . . OR GET ALL 4 FOR $199*

- WordPerfect for Windows
- WordPerfect Presentations
- Paradox for Windows
- Quattro Pro for Windows

*With System Purchase Only. Not Available on ValueLine Systems

MICRON COMPUTER, INC. **800-388-6334**

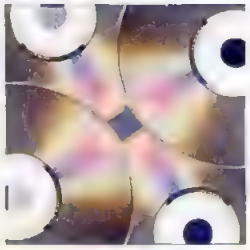
2X CD-ROM DRIVE STANDARD

The competition makes you pay extra for what Micron includes as standard equipment. Our MPC-compliant, double-speed, caddyless drive supports multisession Kodak photo CDs and plays all standard audio CDs. Now Micron ships you DOS and Windows for Workgroups on CD.

EPA ENERGY STAR COMPLIANT

Several Micron systems are available in configurations which are fully compliant with the EPA's Energy Star guidelines. These systems offer you the same Micron performance and value while saving you money through reduced power consumption.

SOFTWARE LIBRARY ON CD-ROM



Try out top titles before you buy! Dozens of programs from leading publishers, including Microsoft, Borland, Lotus, Sierra On-Line, Broderbund and more. Just call Softbank's toll-free number and order. They'll help you download the program right from your CD-ROM.

MICRON MEANS COMPATIBILITY

Micron Pentium and 486 systems are designed in cooperation with leading software manufacturers to achieve compatibility with all major operating systems, including Windows NT™, Windows for Workgroups, IBM OS/2™, and Novell® network products.

CD-ROM DRIVE
AND MORE MEMORY THAN EVER

425VL VALUELINE CD
- Intel™ 486SX 25MHz processor
- Pentium™ Technology Ready (ZIF)
- 4MB RAM, 120MB IDE HD
- Upgradeable cache (to 256K)
- 6 expansion slots: 2 VESA, 6 ISA
- 280ms 1X CD-ROM drive, 3.5" floppy
- Graphics accelerator (1MB)
- 14" Micron 14FG, 1024NI, .28mm, MPRII
- Desktop "Tool Free" chassis
- Microsoft® Mouse, 101-key keyboard
- MS-DOS & Windows™ for Workgroups

$1,299 LEASE - $47/MO.

433VL MAGNUM CD
- Intel 486DX 33MHz processor
- Pentium Technology Ready (ZIF)
- 8MB RAM, 340MB 14ms VLB IDE HD
- 256K 15ns write-back cache, Flash BIOS
- 7 expansion slots: 2 VESA, 7 ISA
- 2X CD-ROM drive, 3.5" floppy
- Diamond SpeedStar Pro VLB (1MB)
- 14" Micron 14FG, 1024NI, .28mm, MPRII
- Desktop "Tool Free" chassis
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows for Workgroups
- Choice of application software

$1,999 DX2 50MHz - ADD $50 DX2 66MHz - ADD $200

466VL WINSTATION CD
- Intel 486DX2 66MHz processor
- Pentium Technology Ready (ZIF)
- 16MB RAM, 340MB 14ms VLB IDE HD
- 256K 15ns write-back cache, Flash BIOS
- 7 expansion slots: 2 VESA, 7 ISA
- 2X CD-ROM drive, 3.5" floppy
- Diamond Viper VLB (2MB VRAM)
- 15" Micron 15FG, 1280NI, .28mm, MPRII
- Desktop "Tool Free" chassis
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows Workgroups
- Choice of application software

$2,799 LEASE - $102/MO.

466VL WINDSERVER CD
- Intel 486DX2 66MHz processor
- Pentium Technology Ready (ZIF)
- 16MB RAM, 527MB 10ms VLB SCSI-2 HD
- 256K 15ns cache (to 512K), Flash BIOS
- 8 expansion slots: 2 VESA, 8 EISA
- 2X CD-ROM drive, 3.5" floppy
- Diamond Viper VLB (2MB VRAM)
- 15" Micron 15FG, 1024NI, .28mm, MPRII
- Tower chassis, 300 Watt, 8 drive bays
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows for Workgroups
- Choice of application software

$3,599 LEASE - $125/MO.

466VL POWERSTATION CD
- Intel 486DX2 66MHz processor
- Pentium Technology Ready (ZIF)
- 16MB RAM, 527MB 10ms IDE HD
- VLB IDE caching controller w/4MB RAM
- 256K 15ns write-back cache, Flash BIOS
- 7 expansion slots: 2 VESA, 7 ISA
- 2X CD-ROM drive, 3.5" floppy
- Diamond Viper VLB (2MB VRAM)
- 17" Micron 17FGx, 1280NI, .26mm, MPRII
- Tower Chassis, 300 Watt, 8 drive bays
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows for Workgroups
- Choice of application software

$3,699 LEASE - $128/MO.

466VL DESIGNSTATION CD
- Intel 486DX2 66MHz processor
- Pentium Technology Ready (ZIF)
- 16MB RAM, 1.0GB 10ms SCSI-2 HD
- SCSI-2 EISA caching controller w/4MB
- 256K 15ns cache (to 512K), Flash BIOS
- 8 expansion slots: 2 VESA, 8 EISA
- 2X CD-ROM drive, 3.5" floppy
- Diamond Viper VLB (2MB VRAM)
- 17" Micron 17FGx, 1280NI, .26mm, MPRII
- Tower chassis, 300 Watt, 8 drive bays
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows for Workgroups
- Choice of application software

$4,799 LEASE - $167/MO.

466PCI WINSTATION CD
- Intel 486DX2 66MHz processor
- Pentium Technology Ready (ZIF)
- 16MB RAM, 340MB 14ms PCI IDE HD
- 256K 15ns write-cache, Flash BIOS
- 8 expansion slots: 3 PCI, 5 ISA
- 2X CD-ROM drive, 3.5" floppy
- Diamond Viper PCI (2MB VRAM)
- 15" Micron 15FG, 1280NI, .28mm, MPRII
- Desktop "Tool Free" chassis
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows for Workgroups
- Choice of application software

$2,899 LEASE - $105/MO.

P60PCI POWERSTATION CD
- Intel Pentium 60MHz Processor
- 16MB RAM, 527MB 10ms IDE HD
- PCI IDE caching controller w/4MB RAM
- 256K 15ns write-back cache, Flash BIOS
- 8 expansion slots: 3 PCI, 5 ISA
- 2X CD-ROM drive, 3.5" floppy
- Diamond Viper PCI (2MB VRAM)
- 15" Micron 15FG, 1280NI, .28mm, MPRII
- Desktop "Tool Free" chassis
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows for Workgroups
- Choice of application software

$3,899 LEASE - $135/MO.

P60PCI MAGSERVER CD
- Intel Pentium 60MHz Processor
- 32MB RAM, 1.0GB 10ms SCSI-2 HD
- PCI FAST SCSI-2 controller
- 256K 15ns write-back cache, Flash BIOS
- 8 expansion slots: 3 PCI, 5 ISA
- 2X CD-ROM drive, 3.5" floppy
- Graphics Accelerator (1MB)
- 14" Micron 14FG, 1024NI, .28mm, MPRII
- Tower chassis, 300 Watt, 8 drive bays
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows for Workgroups
- Choice of application software

$4,399 LEASE - $153/MO.

CUSTOM CONFIGURATIONS WITHOUT CD-ROM DRIVES AVAILABLE: CALL FOR DETAILS!

MICRON COMPUTER, INC.

800-388-6334

yes NetWare Tested and Approved

- NEXT DAY SHIPPING ON MOST SYSTEMS
- 30 DAY RISK-FREE MONEY BACK GUARANTEE
- ONE YEAR EXPRESS PARTS REPLACEMENT
- LIFETIME TOLL-FREE TECHNICAL SUPPORT
- ON-SITE SERVICE OR SYSTEM REPLACEMENT

intel inside

MON-FRI 7AM - 8PM, SAT 8AM - 5PM(MST) • 815 E. Karcher Road • Nampa, Idaho 83687 • (208) 465-3434 • FAX (208) 465-3424

©1995 Micron Computer, Inc. All rights reserved. All prices and specifications subject to change without notice. Micron Computer, Inc. cannot be responsible for omissions, errors in typography or photography. Intel, Intel Inside, Pentium and Overdrive are registered trademarks of The Intel Corporation. Microsoft is a registered trademark and Windows, Windows NT and the Windows logo are trademarks of Microsoft Corporation. The Energy Star emblem does not represent EPA endorsement of any product or service. All other company trademarks are trade names of each respective company. Prices do not include shipping or handling. 30 day risk-free money back guarantee does not include return freight or shipping and handling charges, applies only to Micron brand products, and begins from date of shipment. All returns require RMA numbers and must be shipped in the original packaging provided and intact.

CIRCLE 119 ON READER SERVICE CARD

Compaq Computer Corp.

Compaq Deskpro 5/60M

The Compaq Deskpro 5/60M's Pentium EISA configuration has been around since early last year—an eternity in the personal computer business. Even though it's being overtaken slightly in the performance arena, this package is still one of the best, and it just keeps getting better.

At $8,758, the Deskpro may seem expensive, but this price includes the beautiful, 20-inch Compaq QVision 200 Color Monitor—the best of the Pentium bunch reviewed. And if you add up what other companies will charge for a similar configuration, the Deskpro's price probably won't seem so high.

FACT FILE

Compaq Deskpro 5/60M
Compaq Computer Corp.,
800-345-1518, 713-378-8820

Estimated street price (tested configuration): $8,758.
Memory and processor RAM cache: 16MB 70-ns SIMMs, 256K external cache.
Disk drives and controller: Conner CP3541 19-ms 510MB IDE hard disk with 32K cache, 1.2MB and 1.44MB floppy disk drives, integrated disk controller.
Display: Compaq QVision 1280/E EISA-card video controller with 2MB VRAM, 20-inch Compaq QVision 200 Color Monitor with a 76-Hz refresh rate at 1,280-by-1,024.
Software: DOS 6.0, Microsoft Windows 3.1, Compaq Business Audio, Microsoft Windows Sound System.
In short: Though Compaq's Pentium implementation is older and a little slower than some, this unit's excellent packaging and gorgeous monitor still make it a desktop standard.

ON READER SERVICE CARD

Price/Performance Index: *Pentium PCs*

This crop of Pentium-based systems has several standouts in terms of value. The HiQ P66 Pentium Graphics Ultra Station marks itself as a price/performance leader, offering a roomy tower case with 512K of cache, 16MB of RAM, a 524MB hard disk, and top-notch Windows performance—all for $4,318. DOS performance lags, however.

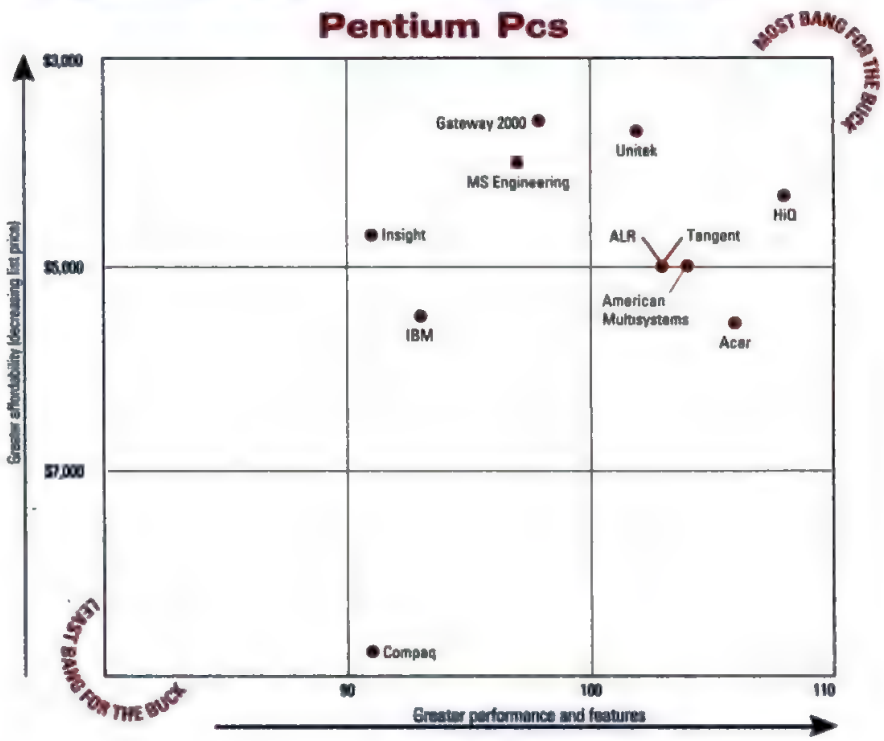
Unitek Technology's UT-Pentium-60LB packs an array of high-end specifications and features similar to those of the HiQ P66. It has two more drive bays; it includes a lifetime labor warranty and one year of on-site service. Performance was solid, and the $3,695 price tag is outstanding. The ALR Evolution V was above average on all of our tests and is the best choice for those using both DOS and Windows.

The Gateway 2000 P5-60 is another alternative. It's priced at $3,595 and includes a tower case, 256K of cache, and a 425MB hard disk—slightly less than what the Pentium-60LB and HiQ P66 offer.

Only one system wound up in our worst price/performance sector: the $8,758 Compaq Deskpro 5/60M. About $2,000 of that comes from the 20-inch Compaq QVision 200 monitor that Compaq sent with the system.

THE DATA POINTS

In determining performance scores, we considered benchmark test scores, hard disk capacity, installed RAM, processor socket, flash BIOS, and expansion features. We also looked at 16550 Universal Asynchronous Receiver/Transmitter (UART) support, extended warranty, on-site service, and bundled software. Benchmark test scores account for 65 percent of the performance index; capacity and expansion features account for the remaining 35 percent. You can find more data in the Software Library of the Editorial Forum on PC MagNet as 02BANG.xls.4.



In return for this price, you get gorgeous picture quality and high-end ergonomics as well as Compaq's carefully Pentium-optimized system board. By using Compaq's well-designed Tri-Flex architecture, the Deskpro is unique in its ability to handle a 64-bit data path to RAM and a super-wide 128-bit path to the 256K secondary cache.

The Pentium processor is held on an easily upgradable processor board that holds the external cache as well. The design of the Pentium processor board represents one of the few quality Pentium upgrade schemes on the market today. The processor board can even be used effectively in older Deskpro M systems, which is terrific news for current Compaq customers. There are five available EISA expansion slots on the board, but the QVision adapter takes up the fifth one.

Compaq Deskpro 5/60M

SUITABILITY TO TASK	
DOS applications	EXCELLENT
Windows applications	GOOD
Expandability	FAIR
VENDOR SERVICE & RELIABILITY	
Reliability	ABOVE AVERAGE
Repair service	AVERAGE
Technical support	ABOVE AVERAGE

Performance for the Deskpro was a little disappointing at times: Its Pentium implementation scored second-lowest on PC Labs' processor tests. The rest of the system managed good to excellent scores, especially on DOS video tests, where the Deskpro's score was almost twice the group's average. The unit's DOSmark score was very competitive, but its Winstone score fell below average and was merely acceptable.

Besides having an outstanding display, the Deskpro shipped with Compaq's Business Audio, which includes Microsoft Windows Sound System drivers. Though not as versatile as some audio boards, Business Audio is nevertheless a solid sound system that is primarily designed for the spoken word. If you really want to play or record music, you can upgrade to a high-fidelity sound board. Manuals for the Deskpro were clear and concise, and Compaq does offer a CD-ROM option.

Compaq's system warranty is very attractive: three years for parts and labor, with the first year of on-site service included.—*OR*

Gateway 2000 Inc.

Gateway 2000 P5-60

Master of the low-cost mail-order PC, Gateway 2000 is making a herculean bid for the infant Pentium market with its Gateway 2000 P5-60 machine. Starting at $2,995 (Gateway's "Best Buy Bundle") the P5-60 is a fully configured PC, which includes one of the first PCI local-bus slots we've seen. But the real payoff is the system's solid performance.

The system that Gateway 2000 sent to PC Labs would cost you $3,595; it included 16MB of RAM (versus the standard 8MB included in the Best Buy Bundle) and a Mitsumi dual-speed CD-ROM drive. Inside Gateway's roomy tower case with eight drive bays—five of which are left empty—is the P5-60's motherboard, constructed by Intel and including the company's latest PCI chip set. In addition to PCI local-bus design, the system board offers integrated IDE controller circuitry and a full 64-bit path to main memory and cache. The external cache, however, which is fixed at 256K, may turn out to be

Portable Power Pentium

by Brian Nadel

Webster's dictionary defines *portable* as anything that is capable of being carried. The handle at the top of Dolch Computer Systems' 66-MHz Pentium-based Dolch P.A.C. 586 is a dead giveaway that this system is meant for movement, but the unit's 19-pound heft and overnight-bag size mean that you're likely to think twice before taking it anywhere. Yet if you go through the effort of lugging the P.A.C. 586 with you, you'll be rewarded with the full desktop-PC power of this unit—the first Pentium workstation designed for the road.

The final prototype unit that we tested was based on a Dolch-designed motherboard and proved to be nothing short of a power-PC user's dream: 64MB maximum RAM and 512K of direct-mapped, write-back external cache. Add to that a SCSI interface, 520MB hard disk, and up to five ISA expansion slots, making this one of the few portable systems that can accept standard desktop components. While the prototype uses a gas-plasma display, the final production unit will use a Sharp 10.4-inch active-matrix color display.

The P.A.C. 586 gives the user top-notch desktop performance. Having achieved a score of 76.7 on our processor benchmark tests, the P.A.C. 586 is among the fastest PCs available, and it has been bested only by the HiQ P66 Pentium Graphics Ultra Station. But this is not a single-purpose machine that doesn't measure up in other areas. Most of the P.A.C. 586's benchmark test scores were above average; its only weak performances, in fact, were on our WinBench Graphics and Winstone tests. The system's performance highlight, however, was its DOSmark score, which was the highest we've seen to date.

But this level of performance doesn't come cheaply. The P.A.C. 586 starts at $6,000, but it comes fully equipped. □

▶FACT FILE

Dolch P.A.C. 586
Dolch Computer Systems, 372 Turquoise St., Milpitas, CA 95035; 408-957-6575.
List price: *Starting at $6,000.*
Configuration: *520MB Quantum SCSI hard disk with 512K hardware cache, 8MB RAM, 66-MHz Pentium, 512K external cache, S3 86C805 video chip set with 2MB of video RAM.*
Circle 492 on reader service card

We Have the Solution To Your Resolutions.

ZEOS
ZEOS

ZEOS® Is Your Solution!

New Year's Resolutions.

RESOLUTIONS	SOLUTIONS
1. Save enough money to buy a red sports car.	1. New lower prices on ZEOS 486 Upgradables! Save even more on our money-saving packages or custom-build a system to your exact needs. Either way, we've got the system for you at the right price. Feature for feature, there's no comparison. ZEOS is the best value!
2. Cancel my standing order at the corner fast food chain.	2. Buy more time with a ZEOS 486! With local bus video and local bus hard drive, you'll get super-fast performance. Now, you can take a real lunch break.
3. Keep Blood Pressure Low!!!	3. Don't be stressed out! A ZEOS 486 is the trouble-free PC that runs without a hitch. We include two cooling fans and a built-in surge suppressor for a more dependable and reliable system. And, if you have any technical questions, we're just a toll-free call away–24 hours a day, 365 days a year.
4. Make my life less chaotic.	4. Free software to help square away your life. Most ZEOS 486 Upgradable packages offer you a choice of one Lotus Windows Application or a low-cost upgrade to SmartSuite. Keep track of meetings, plan your finances on a spreadsheet, create a database, and much more!
5. Travel the world.	5. Prepare for your travels by learning the native language and history of your destination... without leaving your computer! Choose a package with a CD-ROM standard or upgrade with our complete Multimedia Package. Either way, we've got your multimedia needs covered. You're ready to *habla Español*!
6. Accomplish all my resolutions.	6. The solution to your New Year's Resolutions is ordering a ZEOS 486 Upgradable now.

stem Right For You.

PACKAGE 3		PACKAGE 4	
-25 2/month	$1995	486SX-25 Lease $90/month	$2495
-33 6/month	$2095	486SX-33 Lease $94/month	$2595
-33 9/month	$2195	486DX-33 Lease $98/month	$2695
2-50 3/month	$2295	486DX2-50 Lease $101/month	$2795
2-66 0/month	$2495	486DX2-66 Lease $108/month	$2995
erified: for the Pentium™ ive™ Processor		■ **Intel Verified:** for the Pentium™ OverDrive™ Processor	
igh-speed RAM		■ 16MB high-speed RAM	
3, 13ms local bus IDE ive with 128K cache		■ 528MB, 12ms local bus IDE hard drive with 256K cache	
d SpeedStar Pro Windows-ated local bus video with AM (16.7 million colors)		■ Diamond SpeedStar Pro Windows-accelerated local bus video with 1MB RAM (16.7 million colors)	
14" 1024 x 768 NI SVGA onitor, .28mm dot pitch		■ ZEOS 14" 1024 x 768 NI SVGA color monitor, .28mm dot pitch	
-ROM drive 4MB floppy drive		■ **2X CD-ROM drive** and 1.44MB floppy drive	
oft DOS 6.2 with Tools, ws for Workgroups 3.11 osoft Mouse. Choice s Windows application.		■ Microsoft DOS 6.2 with Tools, Windows for Workgroups 3.11 & Microsoft Mouse. Choice of Lotus Windows application.	

FAVORITE OPTIONS

426MB to 528MB HDD UPGRADE.....$75

256K SYSTEM CACHE.....$98

ADAPTEC 6360 SCSI CONTROLLER CHIP
For on-board SCSI. Includes drivers.....**$49**

96/48/24 V.42 bis SEND/RECEIVE FAX MODEM.....$79

DIAMOND VIPER VIDEO CARD
1MB VRAM: **$149**.....2MB VRAM: **$249**

15-INCH MONITOR UPGRADE
SVGA non-interlaced, 1024 x 768, flat screen.....**$95**

LOTUS SMARTSUITE UPGRADE
Five Windows applications in one box! Lotus 1-2-3, Ami Pro, Approach, Freelance & Organizer.....**$299**

COMPLETE MULTIMEDIA PACKAGE
Double-speed, multisession MPC2 compliant CD-ROM, 16-bit/48KHz Cardinal Digital Sound Pro 16 Sound Card with Digital Signal Processor (Soundblaster and Adlib compatible). Labtec stereo speakers.....**$299**

If your system includes a CD-ROM drive, upgrade with a sound card and speakers.....**$149**

Many other affordable upgrades and options available. Call for details!

AWARD-WINNING SERVICE & RELIABILITY

We're the only company to win *PC Magazine*'s Readers' Choice for Service & Reliability–for both desktops and notebooks–*twice!*

TOLL-FREE SUPPORT, WARRANTIES & GUARANTEES

We're here for you 24 hours a day, 365 days a year, and always a toll-free call away. All ZEOS systems come with a One Year Limited Warranty, Express Parts Replacement Policy and a 30-Day Money-Back Guarantee.

ZEOS Upgradables are 100% compatible.

With a ZEOS 486 Local Bus Upgradable, you'll have more time to accomplish the many important things in life and save money doing it! Call now for the solution to your resolutions.

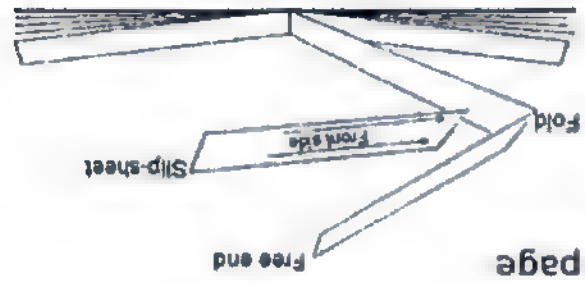
CALL NOW TOLL FREE
800-554-7172
24 HOURS A DAY

Fax Orders: 612-633-1325, Government: 800-245-2449, TDD Orders: 800-228-5389, Outside U.S. and Canada: 612-633-6131. Purchase orders, MasterCard, VISA, Am Ex, Discover, Z-Card,℠ COD and Leasing programs. Open 24 Hours a Day, 365 Days a Year!

otice; call to confirm these and warranty details. Prices do not include shipping. Novell compatibility erDrive are trademarks of Intel Corporation. ZEOS is a registered trademark; Z-Card and Computers
UPGR-PCM-9401B

Inverted Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
   1. Front side touching the free page
   2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet

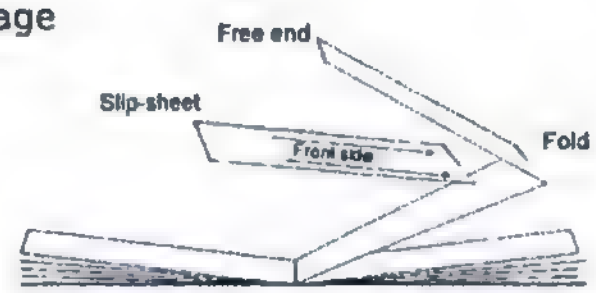


Folded edge of the page

GbsSlipSheet-001

Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
   1. Front side touching the free page
   2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



GbsSlipBack-001B

Back

1. Follow instructions on the other side

Inverted Back

1. Follow instructions on the other side

NEW: LOWER PRICES AND MORE FEATURES

Choose The Sys

STANDARD WITH EVERY ZEOS UPGRADABLE SYSTEM

- **Intel Verified:** for the Pentium™ OverDrive™ Processor. Zero Insertion Force (ZIF) socket makes upgrading easy.
- RAM expandable to 64MB on the motherboard.
- Two serial ports and one parallel port integrated on the motherboard.
- Flash BIOS for easy upgradability.
- Eight expansion slots: two VESA local bus, five 16-bit and one 8-bit.
- ZEOS six-bay desktop case with two cooling fans for increased reliability and product life.
- 200 watt power supply with built-in surge suppression; switchable between 115/230V.
- Socket for inexpensive optional on-board SCSI.
- Shadow RAM support.
- ZEOS 101-key space-saving keyboard.
- FCC Certified Class B; UL Listed.
- Complete ZEOS Customer Satisfaction Package.

PACKAGE 1

486SX-25 **$1195**
Lease $50/month

486SX-33 **$1295**
Lease $55/month

486DX-33 **$1395**
Lease $59/month

486DX2-50 **$1495**
Lease $63/month

486DX2-66 **$1695**
Lease $61/month

- **Intel Verified:** for the Pentium™ OverDrive™ Processor
- 2MB high-speed RAM
- 107MB local bus IDE hard drive with 32K cache
- Diamond SpeedStar Pro Windows-accelerated local bus video with 1MB RAM (16.7 million colors)
- ZEOS 14" 1024 x 768 NI SVGA color monitor, .28mm dot pitch
- One 1.44MB floppy drive
- Microsoft DOS 6.2 with Enhanced Tools

PACKAGE 2

486SX-25 **$1495**
Lease $63/month

486SX-33 **$1595**
Lease $58/month

486DX-33 **$1695**
Lease $61/month

486DX2-50 **$1795**
Lease $65/month

486DX2-66 **$1995**
Lease $72/month

- **Intel Verified:** for the Pentium™ OverDrive™ Processor
- 4MB high-speed RAM
- 214MB local bus IDE hard drive with 128K cache
- Diamond SpeedStar Pro Windows-accelerated local bus video with 1MB RAM (16.7 million colors)
- ZEOS 14" 1024 x 768 NI SVGA color monitor, .28mm dot pitch
- One 1.44MB floppy drive
- Microsoft DOS 6.2 with Tools, Windows for Workgroups 3.11 & Microsoft Mouse

P

486SX Lease $7

486SX Lease $7

486D Lease $7

486D Lease $8

486D Lease $9

- **Intel** OverD
- 8MB
- 426M hard d
- Diamo acceler 1MB
- ZEOS color n
- **2X C** and 1.4
- Micros Windo & Mic of Lotu

The coming of the New Year is an incredible opportunity for self-improvement and setting new goals. Sometimes it's hard to achieve all you've set out to accomplish.

Don't despair. We've made it easy. Many of your New Year's Resolutions can be resolved in one word–ZEOS. We offer more high-quality features standard–and at an even lower price! Many of our money-saving packages can be delivered the same day you order. Plus, we can custom-build a system to your exact specifications. We offer so many extras like:

MORE WAYS TO PAY

- Business Leasing
- MasterCard
- Discover
- Z-Card℠
- COD
- Purchase Orders
- VISA
- American Express
- Money Orders
- Cashiers Checks

For more information, call us today at 800-554-7172.

WINDOWS APPLICATION OPTIONS

Packages 3 and 4 come with your choice of either Lotus Ami Pro, Freelance, 1-2-3, Improv, Organizer or hot new Approach.

Purchase orders are subject to approval. Business leasing programs available. Lease prices based on a 36-month lease; 10% purchase option. All prices, specifications and availability are subject to change without n
is Developer Tested Only. Novell makes no warranties with respect to this product. All products and company names are trademarks or registered trademarks of their respective holders. Intel Inside, Pentium and Ov
Now' are registered servicemarks of ZEOS International Ltd. © 1994 ZEOS International Ltd., 1301 Industrial Blvd., Minneapolis, MN 55413 USA. ZEOS is a publicly traded company (NASDAQ symbol: ZEOS).

A New System For The New Year! Order Now, We'll Ship Today.

IT'S AS EASY AS:

1. Choose what ZEOS system package you want. (A sampling of what's available is shown below.)
2. Call ZEOS at 800-554-7172. For same day shipping, place your order before 1 p.m. Central Time, Monday through Friday.
3. Upon credit approval, we'll ship your system *the same day you order!*

OUR GUARANTEE TO YOU:

If we accept your order for immediate shipment and fail to ship your system under the conditions outlined, we will ship it *at our expense* as soon as it is ready.*

CALL NOW TOLL FREE
800-554-7172
24 HOURS A DAY

ZEOS INTERNATIONAL LTD.

486 SX-25

PACKAGE #2:

- 4MB RAM
- 214MB local bus hard drive with built-in 128K cache
- Windows-accelerated local bus video
- SVGA color monitor
- 1.44MB floppy drive
- DOS, Windows, Mouse

$1495

486 DX-33

PACKAGE #2:

- 4MB RAM
- 214MB local bus hard drive with built-in 128K cache
- Windows-accelerated local bus video
- SVGA color monitor
- 1.44MB floppy drive
- DOS, Windows, Mouse

$1695

486 DX-33

PACKAGE #3:

- 8MB RAM
- 426MB local bus hard drive with built-in 128K cache
- Windows-accelerated local bus video
- SVGA color monitor
- 2X CD-ROM drive and 1.44MB floppy drive
- DOS, Windows, Mouse
- Choice of Windows application

$2195

486 DX2-66

PACKAGE #3:

- 8MB RAM
- 426MB local bus hard drive with built-in 128K cache
- Windows-accelerated local bus video
- SVGA color monitor
- 2X CD-ROM drive and 1.44MB floppy drive
- DOS, Windows, Mouse
- Choice of Windows application

$2495

486 DX2-66

PACKAGE #3 BONUS:

- 8MB RAM
- 256K SRAM system cache
- 528MB local bus IDE hard drive
- Diamond Viper local bus video card
- 15" SVGA color monitor
- 2X CD-ROM and 3.5" drives
- 14,400 bps V.32 bis send/receive fax modem
- DOS, Windows, Mouse
- Choice of Windows application

$2995

486 DX2-66

PACKAGE #4:

- 16MB RAM
- 528MB local bus hard drive with built-in 256K cache
- Windows-accelerated local bus video
- SVGA color monitor
- 2X CD-ROM drive and 1.44MB floppy drive
- DOS, Windows, Mouse
- Choice of Windows application

$2995

486 DX2-66

PACKAGE #4 PLUS:

- 16MB RAM
- 528MB local bus hard drive with built-in 256K cache
- Diamond Viper local bus video card
- Vertical case
- 15" SVGA color monitor
- 2X CD-ROM drive and 1.44MB floppy drive
- DOS, Windows, Mouse
- Choice of Windows application

$3334

Ambra™ 486SX-25

PACKAGE #1:

- 4MB RAM
- 107MB hard drive with built-in 32K cache
- 1.44MB floppy disk drive
- SVGA color monitor
- DOS, Windows, Mouse

$1195

*Orders must be for ZEOS *Computers Now!*™ configurations, we've listed just a sampling here. Since we continuously update this list of configurations, *please call to confirm your system is on the list.* This offer is good only as long as these pre-built systems remain in stock. Other ZEOS systems and custom configurations take slightly longer—about a week. Credit cards are subject to authorization. Orders must be received by 1 p.m. Central Time, M-F

Circle 155 on reader service card.

limiting for some power-hungry applications.

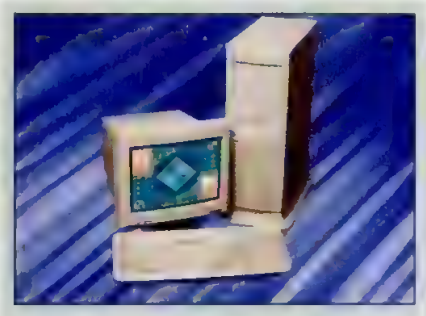
The P5-60's video subsystem is worth extra note since it includes ATI's new Ultra XLR Mach32 PCI video adapter with 2MB of dedicated DRAM. This adapter is wired to a standard 15-inch Gateway CrystalScan monitor, making up the standard bundle that comes with the $2,995 product. For $3,995, you can get a higher-end configuration, which includes a 17-inch display and a 528MB IDE hard disk (instead of the 425MB hard disk bundled with our test system). The system's video performance was bifurcated: It was the best of the group under DOS, slightly below average under Windows.

Gateway 2000 P5-60

SUITABILITY TO TASK	
DOS applications	EXCELLENT
Windows applications	GOOD
Expandability	EXCELLENT
VENDOR SERVICE & RELIABILITY	
Reliability	ABOVE AVERAGE
Repair service	ABOVE AVERAGE
Technical support	ABOVE AVERAGE

The Western Digital 425MB hard disk performed below average under both DOS and Windows. The P5-60's DOSmark score, however, was well above average, buoyed by an astronomical DOS video score. The unit's Graphics WinMark and Winstone test scores were both about average, and the Pentium's processor score was well within normal parameters.

The P5-60 also shipped with Gateway's well-written manuals, an AnyKey programmable keyboard, and DiagSoft's Q&APlus diagnostic software. You're also allowed the choice of one popular Microsoft or Borland business application at the time of purchase. Gateway also includes its System CD, which covers on-line system documentation and various Windows 3.1 multimedia programs such as Media Browser and Music Box. Gateway's standard warranty is one year's worth of parts and labor with free on-site service. Technical support is toll-free and available from 7:00 to 1:00 on weekdays and from 10:00 to 3:00 on Saturdays, eastern time.—*OR*



FACT FILE

Gateway 2000 P5-60

Gateway 2000 Inc.,
800-846-2000, 605-232-2000

List price (tested configuration): $3,595
Memory and processor RAM cache: 16MB 70-ns SIMMs, 256K external cache.
Disk drives and controller: Western Digital Caviar AC2420 22-ms 425MB IDE hard disk with 128K cache, 1.44MB floppy disk drive, Mitsumi dual-speed CD-ROM drive, integrated disk controller
Display: ATI Ultra XLR Mach32 PCI local-bus-card video controller with 2MB DRAM, MAG CrystalScan 1572 FS 15-inch monitor with a 72-Hz refresh rate at 1,280-by-1,024
Software: DOS 6.0, Microsoft Windows 3.1, Central Point Tools on Top choice of applications.
In short: The Gateway 2000 P5-60, which sells for $3,595 with PC Labs' requested configuration and a Mitsumi CD-ROM drive, held the enviable position of being one of the best-equipped PCs in this high-flying group—at the lowest price

445 ON READER SERVICE CARD

HiQ Computer Systems Inc.

HiQ P66 Pentium Graphics Ultra Station

HiQ Computer System's HiQ P66 Pentium Graphics Ultra Station, which is priced at $4,318, is one of two systems in this roundup that carried a 66-MHz Pentium chip. And although the unit performed well on most of our benchmark tests, its performance wasn't consistent, with DOS operation taking a back seat to Windows operation.

HiQ P66 Pentium Graphics Ultra Station

SUITABILITY TO TASK	
DOS applications	FAIR
Windows applications	EXCELLENT
Expandability	EXCELLENT

The HiQ P66's performance was aided by the TMC Research system board, which can accommodate up to 512K of external RAM cache with a 64-bit data path to the processor; another 64-bit path allows the Pentium to talk to system memory (expandable to 128MB on-board). The TMC system board also holds five ISA and three VL-Bus expansion slots, which should be more than enough for most users. Of the latter, two are taken up—one by the Diamond Viper VLB graphics adapter carrying the blazing Weitek Power 9000 chip, the other by a Promise DC-4030VL IDE hard disk controller with a hefty 8MB of cache.

HiQ packed all this in a seven-bay tower case with plenty of cooling potential: one mini-fan on top of the Pentium's heat sink, and a second, larger fan off to the side. Though the included 15-inch ADI MicroScan 4G display is adequate, HiQ also offers 17- and

FACT FILE

HiQ P66 Pentium Graphics Ultra Station

HiQ Computer Systems Inc., 800-827-5836, 408-245-5836

List price (tested configuration): $4,318.
Memory and processor RAM cache: 16MB 60-ns SIMMs, 512K external cache
Disk drives and controller: Quantum ProDrive 525AT 17-ms 524MB IDE hard disk with 256K cache, 1.2MB and 1.44MB floppy disk drives, Promise DC-4030VL VESA local-bus-card disk controller with 8MB cache.
Display: Diamond Viper VLB VESA local-bus-card video controller with 2MB of VRAM, ADI MicroScan 4G 15-inch monitor with a 60-Hz refresh rate at 1,280-by-1,024
Software: DOS 6.0, Microsoft Windows 3.1.
In short: With its solid test performance under Windows, a full-featured component bundle, and an attractive price as well, the HiQ P66 Pentium Graphics Ultra Station deserves a close look as a Windows-only PC system.

446 ON READER SERVICE CARD

20-inch monitors. CD-ROM drives are available from Panasonic, TEAC, Texel, and Toshiba, while audio boards originate from Creative Labs or Media Vision.

On our benchmark tests, the HiQ P66 turned in solid scores. Its processor score took first place, thanks primarily to the expensive 66-MHz processor. Windows video and disk performances were aided by the power of the processor, and the HiQ P66 turned in two record scores: Its Graphics WinMark and Winstone scores were the best to date.

On the other hand, the machine's DOS scores were midrange for the group, with the exception of the DOS video score, which was far below average due to the P9000 chip's penchant for the Windows environment. The bottom line is that the HiQ P66 is an excellent system for a Windows workstation but only a mediocre system under DOS.

The few shortcomings in the HiQ P66 system were superficial: System documentation consisted only of technical manuals for the individual components, and the cabling scheme for this unit bordered on sloppy.

HiQ sells either direct or through one of its outlets in Sunnyvale, California, or Atlanta, Georgia. Its standard warranty is one year parts and two years labor, but on-site service is not available.—*OR*

IBM Personal Computer Co.

IBM ValuePoint P60/D

The IBM ValuePoint P60/D, priced at $5,479, offers solid performance and PCI technology for a decent price. IBM positions the system as an engineering desktop, but its performance was marred by a cluttered case design that may make expansion difficult.

Video is where the ValuePoint excels, particularly under DOS. The ATI 68800-AX chip set integrated on the system's motherboard delivered a well-above-average DOS video score and managed average performance on Graphics WinMark tests. The integrated disk controller and 13-ms Maxtor 527MB hard disk pulled together to produce a solid disk score under both DOS and Windows. The unit's processor score was above average as well, leading to an above-average DOSmark score and a very good Winstone score.

On the downside, some users may find the desktop case cluttered. Cabling is messy and the drive side of the case leaves little room to access components. There are five drive bays in total, and three are filled—one with a hard disk and two with floppy disk drives. IBM does not currently offer a higher-capacity IDE drive than the 527MB hard disk that comes with this unit, and no SCSI drives are available.

The AMI motherboard has three 16-bit ISA slots and two PCI slots, all free. The motherboard can take up to 128MB of RAM using 32MB SIMMs, but they are difficult to reach under the floppy disk drives. The Pentium is in a ZIF socket, but the clock crystal is fixed at 60 MHz to accommodate future chips that will run internally at 100 MHz but externally at 60 MHz. The CPU is cooled with a heat sink and fan that are mounted on the chip. IBM has provided the Pentium chip with 64-bit data paths to the external cache and main memory. The unit's design supports burst reads and writes to and from RAM but not to and from the external cache.

If you want to add on to the ValuePoint, IBM has a wide variety of peripherals to choose from, such as a tape backup, IBM's 17- or 21-inch VESA-compliant monitors (15-inch is standard), Panasonic's dual-speed CD-ROMs, and Creative Labs Sound Blaster 16 ASP sound cards. PCI cards for SCSI, networking, and video devices are available also. Documentation is very complete and includes step-by-step instructions for all upgrades.

IBM offers the ValuePoint with a one-year parts-and-labor warranty; on-site service is included for the first year. The company's technical support line is toll-free and available 24 hours a day, seven days a week.—*Anush Yegyazarian*

IBM ValuePoint P60/D

SUITABILITY TO TASK	
DOS applications	EXCELLENT
Windows applications	EXCELLENT
Expandability	FAIR
VENDOR SERVICE & RELIABILITY	
Reliability	ABOVE AVERAGE
Repair service	ABOVE AVERAGE
Technical support	AVERAGE

FACT FILE

IBM ValuePoint P60/D
IBM Personal Computer Co., 800-426-2968, 914-766-1900

List price (tested configuration): $5,479
Memory and processor RAM cache: 32MB 70-ns SIMMs, 256K external cache
Disk drives and controller: Maxtor MXT-540A 13-ms 527MB IDE hard disk with 256K cache, 1.2MB and 1.44MB floppy disk drives, integrated disk controller
Display: Integrated ATI local-bus video controller with 1MB video RAM, IBM 6325 15-inch monitor with a 75-Hz refresh rate at 1,024-by-768
Software: DOS 6.1, Microsoft Windows 3.1
In short: The IBM ValuePoint P60/D offers solid performance and PCI technology for a decent price. IBM positions the system as an engineering desktop. Despite an excellent score on the processor benchmark tests, the ValuePoint Pentium offering lagged on our benchmark tests in terms of disk performance. In addition, the system's cluttered desktop design may make expansion difficult.

447 ON READER SERVICE CARD

Insight

Insight Pro Pentium-EISA

Insight's Pentium system balances somewhat limited expansion capabilities with generally good performance and a $4,699 price. Though the Insight Pro Pentium-EISA came with neither VL-Bus nor PCI architecture—relying instead on the high-end EISA bus—Insight does intend to ship a PCI high-end system and midrange CD-ROM–equipped system early this year.

This EISA system, however, is worth a close look. Only one of its six expansion slots is taken up—with the BusLogic SCSI controller for the Seagate 525MB drive. All other components are integrated on the Intel motherboard. This integration

THE ZEOS® PANTERA™– YOUR *BEST* PENTIUM™ PROCESSOR SOLUTION.

Hey, all you speed demons. Looking for the fastest thing around? Search no longer. The ZEOS Pantera has arrived!

It's fast. It's powerful. It's the ultimate system. It's a multi-user must. Tough enough to run your toughest applications at record-breaking speed. The ZEOS Pantera system is intended for the strenuous and staggering demands of today's business computing world.

intel inside pentium PROCESSOR

Our pure performance system begins with an innovative, high-tech motherboard only available in our Pantera systems.

Designed by ZEOS, the Pantera motherboard takes advantage of the Pentium processor's advanced features and includes the hottest new local bus

Pure Performance.

technology, PCI. PCI delivers 32-bit data transfer at a rate up to 132MB per second! We give you 3 PCI slots in addition to 5 ISA slots. Also on the motherboard: *integrated* business audio with digital sound record and playback, and optional *integrated* SCSI.

NEW PACKAGES AND LOWER PRICES!

What else? More features standard like a sizzling PCI local bus video card and Flash BIOS. Plus, plenty of options…including a lightweight headset with boom microphone ($29) to take full advantage of your business audio needs.

The performance from ZEOS Pantera is a must for network servers or high-end systems. It's also the speedy ticket to improving your business. Quick, call 800-554-7172 and we'll hook you up to the fastest system around!

STANDARD WITH EVERY ZEOS PANTERA SYSTEM

- 60MHz or 66MHz Intel Pentium™ processor.
- 256KB cache expandable to 512KB.
- RAM is expandable to 192MB on the motherboard.
- Windows-accelerated PCI local bus SVGA color graphics card with 1MB RAM.
- High-speed serial and enhanced parallel ports.
- Three PCI slots and five ISA slots.
- Socket for optional on-board Fast SCSI-2 support.
- 12-bit ADPCM business audio integrated right on the motherboard.
- Flash BIOS for easy upgradability.
- 200 watt power supply with built-in surge suppressor. Switchable between 115/230V.
- Two cooling fans in every case.
- ZEOS 101-key space-saving keyboard.
- FCC Certified Class B; UL Listed.
- 24-hour-a-day support & more!

PACKAGE 1	PACKAGE 2	PACKAGE 3	PACKAGE 4
PANTERA-60 $2495	**PANTERA-60 $2995**	**PANTERA-60 $3395**	**PANTERA-60 $3995**
PANTERA-66 $2795	**PANTERA-66 $3295**	**PANTERA-66 $3695**	**PANTERA-66 $4295**
■ 4MB RAM	■ 8MB RAM	■ 12MB RAM	■ 16MB RAM
■ 214MB local bus IDE hard drive	■ 340MB local bus IDE hard drive	■ 528MB local bus IDE hard drive	■ 1GB SCSI hard drive
■ ZEOS 14" 1024 NI SVGA color, .28mm dp	■ **ZEOS 15"** 1024 NI SVGA color, .28mm dp	■ **ZEOS 15"** 1024 NI SVGA color, .28mm dp	■ **ZEOS 15"** 1024 NI SVGA color, .28mm dp
■ 3.5" floppy drives	■ **2X CD-ROM** and 3.5" drives	■ **2X CD-ROM** and 3.5" drives	■ **2X CD-ROM** and 3.5" drives
■ Six-bay desktop case	■ **Ten-bay vertical case**	■ **Ten-bay vertical case**	■ **Ten-bay vertical case**
■ MS-DOS 6.2, Windows for Workgroups 3.11, Microsoft Mouse	■ MS-DOS 6.2, Windows for Workgroups 3.11, Microsoft Mouse	■ MS-DOS 6.2, Windows for Workgroups 3.11, Microsoft Mouse	■ MS-DOS 6.2, Windows for Workgroups 3.11, Microsoft Mouse
	■ Choice of Lotus Windows Application	■ Choice of Lotus Windows Application	■ Choice of Lotus Windows Application

CALL NOW TOLL FREE
800-554-7172
24 HOURS A DAY

Fax Orders: 612-633-1325, Government: 800-245-2449, Hearing Impaired (TDD): 800-228-5389, Outside U.S. and Canada: 612-633-6131. Purchase Orders, MasterCard, VISA, Discover, Am Ex, Z-Card,™ COD and affordable business leasing programs. Open 24 Hours a Day, 365 Days a Year!

ZEOS PENTIUM PROCESSOR SOURCE

Purchase orders are subject to approval. Business leasing programs available. Lease prices based on a 36-month lease 10% purchase option. All prices, specifications and availability are subject to change without notice, call to confirm these and warranty details. Prices do not include shipping. All products and company names are trademarks or registered trademarks of their respective holders. Intel Inside and Pentium Processor Logos are trademarks of Intel Corporation. ZEOS is a registered trademark. Z-Card and Computers Now are registered servicemarks. Pantera is a trademark of ZEOS International Ltd. © 1994 ZEOS International Ltd. 1301 Industrial Blvd. Minneapolis, MN 55413 USA. ZEOS is a publicly traded company (NASDAQ symbol: ZEOS). PEN-PCM-9401B

CIRCLE 125 ON READER SERVICE CARD

Alternatives to the Pentium

by William P. Flanagan and Amarendra Singh

With the eternal quest for more processing power and the slow arrival of 66-MHz Pentium chips, many users anxious for Pentium-level power are seeking alternatives. We examined three different paths to PC power: a system that can accommodate a 486, a Pentium, or even an Alpha processor; a system using IBM's Blue Lightning chip; and a system using a pair of 486 processors. These three alternatives emphasize cost, power, and flexibility.

• DECpc XL 560

For those seeking to hedge the bet between complex and reduced instruction-set computing chips, Digital Equipment Corp. offers a system with the flexibility to use either. Using PCI as a bridge to the system's ISA bus, the DECpc XL 560 accommodates a variety of processor boards for CISC chips (486DX/33, 486DX2/66, and 60-MHz and 66-MHz Pentium chips) and RISC chips (Digital's Alpha AXP RISC chip). This impressive system arrived too late to be reviewed. At present, only 486 and Pentium cards are available, but if their operation is any indication, no compromises have been made in engineering this two-way PC.

Across the spectrum of our tests, the XL 560 was one of the best-performing Pentium systems we've seen. While some of the results were skewed by the system's enormous 1GB disk drive, other scores were exceptional. In fact, many of the XL 560's scores top those of products in Digital's ST line of Pentium systems.

▶FACT FILE

Digital Equipment Corp., 40 Old Bolton Rd., Stow, MA 01775; 800-722-9332.

List price: *$6,063.*

Configuration: *60-MHz Pentium chip, 16MB RAM, 1GB hard disk, 17-inch monitor, DOS 6.0, Windows 3.1.*

Circle 491 on reader service card

• Eltech Splendor III

The Eltech Splendor III from Eltech Research is the first implementation we've seen of IBM's new clock-tripled Blue Lightning chip. Called the 486SLC3, this chip runs externally at 25 MHz and internally at 75 MHz. It is the fastest IBM-made CPU and the company's first true 32-bit CPU design, but its test scores fall between those of Intel's 486DX2/50 and 486DX/50 chips. The processor score for the Splendor, which uses an IBM-designed and -produced motherboard, was 33.9—about 15 percent lower than the average score for a DX2/66 PC. Windows performance was significantly better, with scores closer to average DX2/66 scores. Considering its level of performance—and $2,499 price tag—the Splendor is more a midlevel PC for those on a tight budget than it is a direct Pentium competitor. This is only the first of many implementations, and we expect that future implementations—from Eltech and other vendors, including IBM itself—could yield even more power. In addition, IBM plans to design a 100-MHz chip, which will run at a clock-tripled 33 MHz.

▶FACT FILE

Eltech Research Inc., 48890 Milmont Dr., #108D, Fremont, CA 94538; 800-358-8330.

List price: *$2,499.*

Configuration: *486SLC3 chip, 16MB RAM, 340MB hard disk, 15-inch monitor, DOS 6.0, Microsoft Windows 3.1.*

Circle 489 on reader service card

• VTech Platinum SMP

The VTech Platinum SMP is designed to accept a second CPU that can be used when running Microsoft Windows NT. Our testing platforms—DOS and Windows—could not take advantage of the second processor. This is a system designed to take full advantage of Windows NT. Unfortunately, there are no applications available for the operating system. Though users unwilling to commit to Windows NT may feel limited, the system's performance with a single CPU still falls somewhere between that of a high-end 486 and that of a low-end Pentium. And while the tested unit did not perform as well as an average Pentium PC, a second processor could easily compensate for that. □

▶FACT FILE

VTech Computers Inc., 800 Church St., Lake Zurich, IL 60046; 800-883-2467.

List price: *$3,999.*

Configuration: *Two 486DX2/66 chips, 16MB RAM, 527MB hard disk, 15-inch monitor, CD-ROM drive, DOS 6.0, Microsoft Windows 3.1, Microsoft Windows NT.*

Circle 490 on reader service card

Alternatives to the Pentium

Higher scores represent better performance	Processor	Video	Disk	DOSmark	Graphics WinMark (millions of pixels per second)	Disk WinMark	Winstone
486DX2/66 average	39.7	3,359	1,050	592.7	9.5	861	49.5
Pentium average (60- and 66-MHz units)	70.8	1,981	1,400	778.6	15.4	1,240	75.6
DECpc XL 560 (Pentium/60 chip)	69.8	2,118	1,210	871.0	19.9	1,488	66.1
Eltech Splendor III (486SLC3/75 chip)	33.9	3,561	932	540.7	7.7	830	46.0
VTech Platinum SMP (two 486DX2/66 chips)	46.9	5,372	1,287	753.4	8.3	1,110	60.0

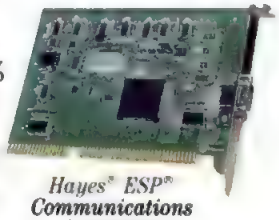
Hayes Delivers The New Standard For High-Speed Global Communications.

Four Times Faster Than A 14,400 Bit/s Modem!

Introducing the Hayes® OPTIMA™ 288 V.FC™ + FAX. An incredibly advanced modem that incorporates the *V.Fast Class*™ 28,800 bit/s technology developed by Hayes and Rockwell International. The same technology that's being supported by more than 125 other modem manufacturers worldwide as the new industry standard for high-speed performance. OPTIMA 288 not only communicates with other *V.Fast Class* modems, it will work with future Hayes modems incorporating the ITU-T V.34(V.Fast) standard. And, it communicates easily with today's installed base of modems.

$579 Estimated Retail Price

Faster Than You Think. With the enhanced technology of Hayes, you'll obtain ***twice*** the speed you thought you'd get from a 28,800 bit/s modem. OPTIMA 288 supports port speeds up to 230,400 bit/s and transfers graphics files at 200,000 bit/s. It's especially powerful for remote connectivity to or from a LAN, remote control, transferring large files, or multi-media. You could save as much as 75% on connect charges. OPTIMA 288 provides the clarity and convenience of FAX at 14,400 bit/s, **plus fast, easy-to-use Smartcom™ for Windows™ LE data communications software, and Windows FAX software.**



Hayes® ESP® Communications Accelerator

Add The Hayes® ESP® Communications Accelerator for $99ERP. Our fast Serial Port helps prevent data loss and achieve speeds of 230,400 bit/s when using Windows or LAN based communications.

For more information or to find out about our Corporate Offer, call **800-HAYES-28,** or call our FAX back service *Hayes FAX Response* at **800-HAYES-FX** and request Document 288.

In Canada, call us at **800-665-1259.**

Hayes®
Increasing the Speed of Business.™

Go *Online With Hayes* BBS: call 800-874-2937 or 404-446-6336. ©1993 Hayes Microcomputer Products, Inc., P.O. Box 105203, Atlanta, GA 30348. Hayes, the Hayes icon, the Hayes logo and ESP are registered trademarks, and the Hayes '302 Escape Sequence Patent icon, Increasing the Speed of Business, OPTIMA, and Smartcom are trademarks of Hayes Microcomputer Products, Inc. V.Fast Class and V.FC are trademarks of Rockwell International Corporation. Other trademarks mentioned are those of their respective companies. Estimated price is in U.S. dollars.

CIRCLE 933 ON READER SERVICE CARD

Read 'em

Reading our Pentium-based system configurations will bring tears to your eyes. If you're looking for the best deal on the highest performance PC, they'll be tears of joy. If you're a competitor, they'll be burning tears of abject defeat. In fact, *PC Computing* named Gateway 2000's P5-60 the 1993 Best Desktop of the Year. Nobody — NOBODY — has a better deal on Pentium-based PCs than Gateway 2000. And we're shipping them right now by the ~~hundreds~~ *thousands*.

Call today!

P5-60

- Intel 60MHz **Pentium™** Processor
- 16MB RAM
- 256KB Cache
- 528MB 12ms IDE Hard Drive
- PCI ATI™ Ultra XLR 2MB Graphics
- Double-Speed CD-ROM
- PCI Local Bus
- 3.5" Diskette Drive
- 17" Color CrystalScan® 1776FS
- Tower Case, 300-Watt Power Supply
- AnyKey® Keyboard & MS Mouse
- MS-DOS® & Windows™
- Choice of Application Software

$3995

intel inside pentium processor

© 1993 Gateway 2000, Inc. AnyKey, CrystalScan, "G" logo and "You've got a friend in the business" slogan are registered trademarks, and Gateway 2000 is a trademark of Gateway 2000, Inc. The Intel Inside Logo, Intel and Pentium are trademarks or registered trademarks of Intel Corporation. All other brands and product names are trademarks or registered trademarks of their respective companies. Prices and configurations are subject to change without notice. Prices do not include shipping.

and weep!

P5-60 Best Buy

- Intel 60MHz **Pentium** Processor
- 8MB RAM
- 256KB Cache
- 424MB 13ms IDE Hard Drive
- PCI ATI Ultra XLR 2MB Graphics
- Double-Speed CD-ROM
- PCI Local Bus
- 3.5" Diskette Drive
- 14" Color CrystalScan 1024NI
- Tower Case, 300-Watt Power Supply
- AnyKey Keyboard & MS Mouse
- MS-DOS & Windows
- Choice of Application Software

$2995

GATEWAY2000

"You've got a friend in the business."

800-846-2063

610 Gateway Drive • N. Sioux City, SD 57049-2000
Phone 605-232-2000 • Fax 605-232-2023

led to the Insight's above-average Disk WinMark score and a slightly lower but still good disk score under DOS. In addition, the unit's processor and DOSmark scores were significantly above average.

The one trouble spot for this machine, however, was Western Digital Corp.'s video chip, which is also integrated on the motherboard. Though the unit produced a great video score under DOS, it couldn't keep up on the Graphics WinMark tests, thus turning in the lowest score of this roundup in that category. The unit's Winstone score was below average as well. So if you're a heavy user of Windows applications, you'd do well to consider installing a separate video card.

Insight Pro Pentium-EISA

SUITABILITY TO TASK	
DOS applications	EXCELLENT
Windows applications	GOOD
Expandability	FAIR

FACT FILE

Pro Pentium-EISA
Insight, 800-927-7848, 602-902-1176

List price (tested configuration): $4,699
Memory and processor RAM cache: 16MB 70-ns SIMMs, 256K external cache
Disk drives and controller: Seagate ST3600N 19-ms 525MB SCSI-2 hard disk with 256K cache, 1.2MB and 1.44MB floppy disk drives, BusLogic BT-747 EISA-card disk controller
Display: Intel-integrated video controller with 1MB DRAM, CTX CMS-1561/LR 15-inch monitor with a 72-Hz refresh rate at 1,024-by-768
Software: DOS 6.0, Microsoft Windows 3.1
In short: Insight's Pro Pentium EISA system balances somewhat limited expansion capabilities with generally good performance and an attractive $4,699 price. Though this unit came with neither VL-Bus nor PCI local-bus architecture, the EISA bus was more than adequate. Insight does intend to ship a PCI high-end system and midrange CD-ROM–equipped system by the end of the year.

448 ON READER SERVICE CARD

In addition, the Insight's desktop case does limit expansion. Its two external bays are both filled, each with a floppy disk drive (a dual-media drive would have been a better choice for this system), but there is one internal 3.5-inch drive bay free. Unfortunately, it's located under the floppy disk drives, which means you'll have to remove them to install anything there.

This system's processor and external cache are mounted on a card to facilitate upgrades when higher-performance processors are available, but the cache is currently fixed at 256K. In addition to the proprietary processor slot, the Insight has a free proprietary memory slot that can take up to 256MB, bringing the possible RAM total to 374MB. Though the data path between the processor and main memory is 32 bits, Insight has provided a 64-bit path between the processor and external cache.

Insight customizes its systems and has a wide variety of peripherals available—from tape back up and CD-ROMs to sound cards and variously sized monitors from major vendors. The unit comes with a one-year warranty with no on-site service. Technical support via a toll-free number is available 24 hours a day, seven days a week.—*AY*

MS Engineering Inc.

MSE Pentium-P

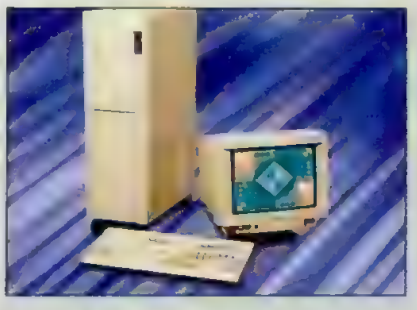
The $3,995 MSE Pentium-P from MS Engineering has a reasonable price and better-than-adequate performance to recommend it. But even though this system does feature the new PCI local-bus architecture, its components don't live up to the performance promise of this technology.

The Pentium-P came with an Asustek motherboard with three PCI slots and five ISA slots. A 2MB Weitek PCI card carrying the Weitek Power 9000 chip took up one PCI slot; another was taken up by an ISA GSI-18 disk controller governing the 510MB Conner IDE drive. Neither of these components helped the Pentium-P's performance: DOS disk and Disk WinMark scores were the lowest of this group of 11 Pentium systems; DOS video scores came in well below average. The P9000 chip helped bring up the Graphics WinMark score to about average but couldn't distinguish it further, which is surprising for a chip that is known for its powerful performance under Windows. As a result of poor component performance, Winstone and DOSmark scores were slightly below average as well.

MSE Pentium-P

SUITABILITY TO TASK	
DOS applications	GOOD
Windows applications	GOOD
Expandability	EXCELLENT

Though our tests focused mainly on workstation use, MS Engineering touts this system as having client/server aspirations, even though the system is based on the ISA bus. The unit's processor score came in slightly above average,



FACT FILE

MSE Pentium-P
MS Engineering Inc., 408-257-4249

List price (tested configuration): $3,995.
Memory and processor RAM cache: 16MB 70-ns SIMMs, 256K external cache.
Disk drives and controller: Conner CP3504 20-ms 510MB IDE hard disk with 256K cache, dual 1.2MB/1.44MB floppy disk drive, GSI Model 18 ISA-card disk controller
Display: Weitek Power 9000 PCI local-bus-card video controller with 2MB video RAM, Mag MX15F 15-inch monitor with a 60-Hz refresh rate at 1,280-by-1,024
Software: DOS 6.0, Microsoft Windows 3.1.
In short: The MSE Engineering MSE Pentium-P, though an adequate system for low-end needs, unfortunately doesn't take full advantage of the available technology. Performance on our disk benchmark tests, under both DOS and Windows, was not up to par.

449 ON READER SERVICE CARD

The Secret To Our Success Is Really Quite Simple.

AUSTIN
AN IPC COMPANY

THE LESS WE THE MORE YOU

Genesis 486SX-33

- 4 MB RAM
- 212 MB Hard Drive
- 512 KB Local Bus Windows™ Accelerator
- 14" SVGA Monitor
- 5 16-bit ISA Slots
- Microsoft® Works

$1,299 Lease $49/month*

Genesis 486DX2-50

- 4 MB RAM
- 128 KB L2 Cache
- 340 MB Hard Drive
- 1 MB Local Bus Windows Accelerator
- 15" NI SVGA Monitor
- 5 16-bit ISA Slots

$1,799 Lease $67/month*

If you'd prefer not to shell out megabucks for your megabytes, you've come to the right page.

Austin specializes in computer systems that are expansive, not expensive. High performance, not high priced.

In other words, value is the name of our game. Value that starts with shrewd pricing, encompasses the hottest new technology, and extends to years of reliable service. Here's what we mean.

All systems, including those with on-the-edge 486 and Pentium™ processors, are flexible, expandable, and can be customized to your specifications. All are available with state-of-the-art CD-ROM drives or full

CHARGE YOU, CAN SPEND.

Premier 486DX2-66

- 8 MB RAM
- 128 KB L2 Cache
- 425 MB Hard Drive
- 1280 x 1024, 2 MB VL-Bus Windows Accelerator
- 15" Digital SVGA Monitor
- 5 ISA & 2 ISA/VL-Bus Slots

$2,499 Lease $93/month*

Premier P5-60

- 60 MHz Pentium™ Processor
- 8 MB RAM, 256 KB L2 Cache
- 425 MB Hard Drive
- Sony Double-spin CD-ROM
- 1280 x 1024, 2 MB PCI Bus Windows Accelerator
- 15" Digital SVGA Monitor
- 4 ISA, 2 PCI and 1 ISA/PCI Slot

$3,149 Lease $110/month*

MediaMagic™ Sound Systems. And all are equipped with an extendable two-year limited warranty on parts and labor; free one-year on-site service; and lifetime toll-free technical support. Plus a reputation that has attracted a wall full of PC Magazine and PC World awards.

Austin Computer Systems. You'll come back for more. Because you can come back for less. Call us toll-free today.

Call Direct 1-800-483-9938

Austin Computer Systems • An IPC Company • 10300 Metric Blvd., Austin, TX 78758
FAX: 512-454-1357 • Overseas: 512-339-3500 • Canada: 1-800-338-1565

AUSTIN
AN IPC COMPANY

©1994 Austin Computer Systems. All rights reserved. MediaMagic is a trademark of IPC Corporation LTD. The Intel Inside logo is a registered trademark and Pentium is a trademark of Intel Corporation. Microsoft is a registered trademark and Windows and the Windows logo are trademarks of Microsoft Corp. All other company names and products are trademarks or registered trademarks of their respective owners. Prices and specifications are subject to change without notice. *Lease term reflects 36-month contract.

CIRCLE 012 ON READER SERVICE CARD

What the Numbers Mean

Performance scores for these 11 Pentium systems show that Intel's latest CPU nearly doubles the processing power of the best 486. Ironically, a well-designed 60-MHz Pentium is capable of outperforming a 66-MHz one, making the slower, less expensive chip the value choice.

PROCESSOR

On the average, the systems in this roundup nearly doubled the performance of most 486DX2/66-based systems. (An average DX2/66-powered unit scored 39.7 on our processor tests; all Pentium systems did better than 66s on these processor tests.) Only two, however, are full 66-MHz designs; the remainder contain the less costly and more obtainable 60-MHz version of the Pentium chip. We found no justification, in terms of performance, for paying a premium—which may amount to as much as $500—for the higher-rated processor.

The fastest of the 60-MHz Pentium systems—the Insight Pro Pentium-EISA—scored 72.6 on our processor tests, while the slower of the two 66-MHz Pentium systems, the AcerPower Series 9000, posted virtually the same score (72.5). The HiQ P66 Pentium Graphics Ultra Station, the other 66-MHz unit here, achieved the highest processor score of 78.2. But within each processor type, we find only a narrow range of scores: The HiQ P66's 7.9 percent edge over the AcerPower is comparable with the Insight's 9.7 percent advantage over the slowest 60-MHz system, Unitek Technology's UT-Pentium60LB, which scored 66.2. In view of our benchmark tests' 3 percent margin of error, there's little or no appreciable performance difference within speed groups.

For now, there's an overwhelming level of homogeneity among the shipping Pentium systems. Among the PCs reviewed, OPTi, Intel, and AMI were the only chip set makers represented—not counting Compaq, which made the chip set for its Compaq Deskpro 5/60M. The three systems with PCI buses—the Gateway 2000 P5-60, IBM ValuePoint P60/D, and MSE Pentium-P—had another common feature worth noting: *write-through* design for external caching. The vendors of these products appear to have taken into account Intel's warning that *write-back* caches conflict with the Pentium in systems with the PCI Mercury chip set.

Each Pentium system is also about twice as fast as the Blue Lightning system discussed in the sidebar "Alternatives to the Pentium." While the IBM-fabricated Blue Lightning processor in the Eltech Splendor III is a 75-MHz clock tripler, its 25-MHz external speed managed to keep its test performance, at best, on a par with the performance of Intel's 486DX2/66 chip. The Intel DX3 clock-tripler chips will most likely be closer to the Pentium in overall performance. Expect to see the first systems using these chips this spring.

DOS VIDEO AND GRAPHICS WINMARK

While the PCI bus holds the promise of improved peripheral performance over VESA's VL-Bus and other local-bus designs, our initial appraisal is that the three PCI systems here fared no better than the other systems in DOS and Windows video. The video chip in each system and its respective drivers were ultimately what mattered the most. Only two systems—the Deskpro and Insight—have no local-bus scheme.

Both Gateway 2000's P5-60 and IBM's ValuePoint shipped with ATI Technologies' newest Mach 32 chip, the 68800AX, while the P5-60 uses a PCI local-bus card to handle video and IBM's video chip set is integrated onto the motherboard. Both the P5-60 and ValuePoint had good Graphics WinMark scores (15.4 and 16.0 million pixels per second, respectively), and they posted first- and second-place DOS video scores (4,197 and 3,307). By contrast, the VL-Bus–based ALR Evolution V, with ATI's standard Mach 32 chip, produced a Graphics WinMark score of 18.1 million—higher than the two PCI systems with the Mach 32 chip.

The other PCI-based unit, the MSE Pentium-P, uses the Windows-intensive Weitek P9000 chip on a Weitek P9000-P card. It produced one of the lowest DOS video scores here (1,205) and a relatively low Graphics WinMark score (12.4 million). The three other systems carrying P9000 chips (all on Diamond Viper cards) were the HiQ P66, the AcerPower, and Unitek's UT-Pentium60LB; these machines posted Graphics WinMark scores of 20.7, 18.3, and 13.6 million, respectively. The bottom line is that we have yet to see PCI measure up to its advanced press or potential.

The high Graphics WinMark scores for the AcerPower and HiQ P66 stem from the fact that these units have the newest drivers. Both systems use the same revision of the Weitek 08 3.10 driver, dated July 27, 1993. The Pentium60LB's score was 34 percent lower than the HiQ P66's score and was based on the use of an April 27, 1993, version of the same driver. Interestingly enough, the MSE Pentium-P has the same driver, but it's the most current of the four, dated September 2, 1993. This system, however, posted a Graphics WinMark score of 12.4 million, the lowest among the machines with this driver. It is possible that this driver was optimized for our previous generation of benchmark tests, Winbench 3.11, and was thus ill equipped to perform as well on our new set of tests.

The biggest discrepancy between DOS and Windows graphics performance was shown by the two systems carrying video cards by Matrox Electronic Systems—the American

Multisystems InfoGold Pentium 60 NT and Tangent VL-P560. Both virtually tied for second place on our Graphics WinMark tests (with scores of just under 19 million), but they fell flat with their disappointing marks for DOS video (both scored about 510). This showing was about 75 percent below the average. Consider a system with the Matrox MGA Ultima VL card only if you seldom see a C: prompt.

DOSMARK

Since the processor scores were all about the same, these systems' peripheral performance made all the difference in their amalgamated DOSmark scores. And the many different video chips and hard disks represented (the components that have the most weight in the DOSmark formula, after the processor) led to wide variations in the DOSmark scores.

DOSmark scores ranged from a low of 494.8, posted by the Tangent VL-P560, to a high of 949.5, posted by IBM's ValuePoint. Good video and disk performance were the keys to the ValuePoint's high DOSmark score. With its new, integrated ATI Mach 32 68800AX chip and Maxtor 540A hard disk, it ranked second on our DOS video tests and fifth on our disk tests.

Having garnered a third-place disk score with the same drive, the ALR Evolution V earned a second-place DOSmark score of 941.5. With its ATI video card carrying the standard Mach 32 chip—the 68800—the same unit had a fourth-place DOS video score of 2,592.7. Gateway 2000's P5-60, with its later-model Mach 32 chip, overcame a disk score that placed second to last and posted a first-place DOS video score; these secured a third-place DOSmark score.

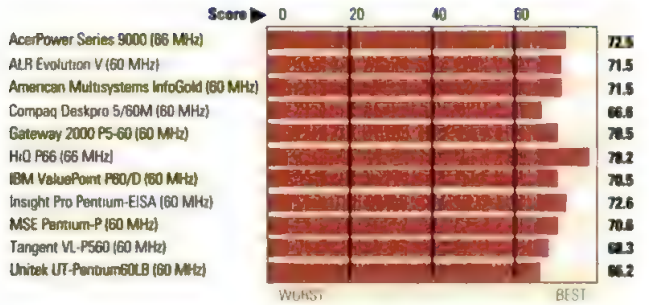
DOS DISK

Because of the raw horsepower of these systems, their disk scores could not be rated anything but good. And a few achieved excellence. The AcerPower, with its 520MB SCSI-2 Fujitsu drive, blew away the others. Its score of 1,882 demonstrates the swiftest drive performance we've seen in any system since last fall's introduction of PC Bench 8.0. Not only was it more than twice as fast as the slowest system in the lineup (the MSE Pentium-P, with a 20-millisecond Conner CP3504), its score was about 14 percent ahead of the two systems closest to its heels, American Multisystems' InfoGold and the ALR Evolution V—both of which came with Maxtor MXT-540 hard disks.

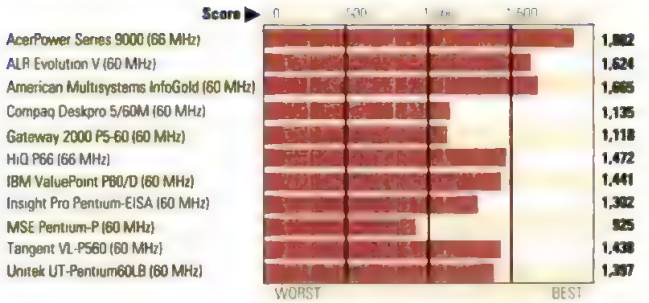
Of those three top-performing systems, only the third-place ALR Evolution V—with a score of 1,624—utilized a hardware caching controller card: a Promise DC-4030VL with 4MB of RAM. The two other systems, the HiQ P66 and Pentium60LB, had the same Promise card—with 8MB of RAM and 2MB of RAM, respectively.

While these mighty hardware-enhanced controller cards dramatically improve the performance of just about any drive, the effect of all hard disk caching controllers has recently been diminished somewhat. With the introduction of our new benchmark tests, we began the practice of testing all systems with SmartDrive invoked.

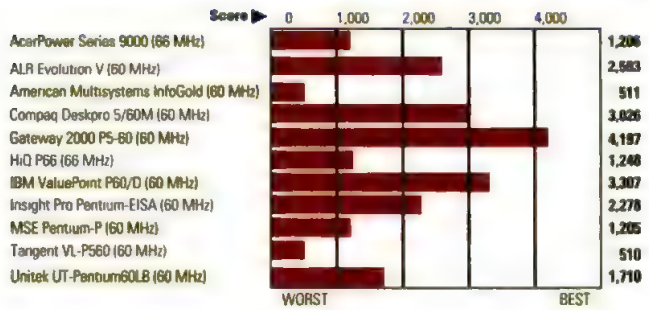
PROCESSOR



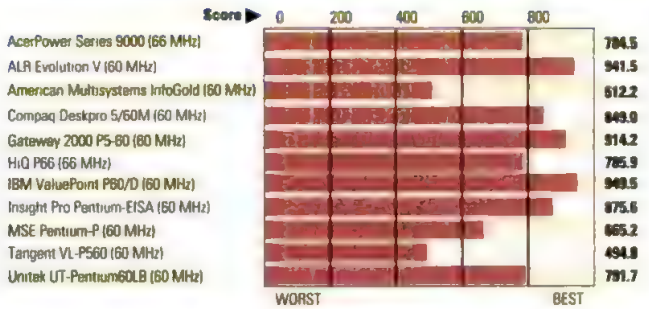
DISK



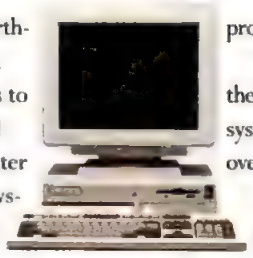
VIDEO



DOSMARK



All the horsepower in the world is worthless if you can't make the most of it. And the same is true when it comes to computers. Performance is determined not only by the chip, but by the computer around the chip. After all, if the subsystems slow you down, having a powerful processor doesn't make much difference.

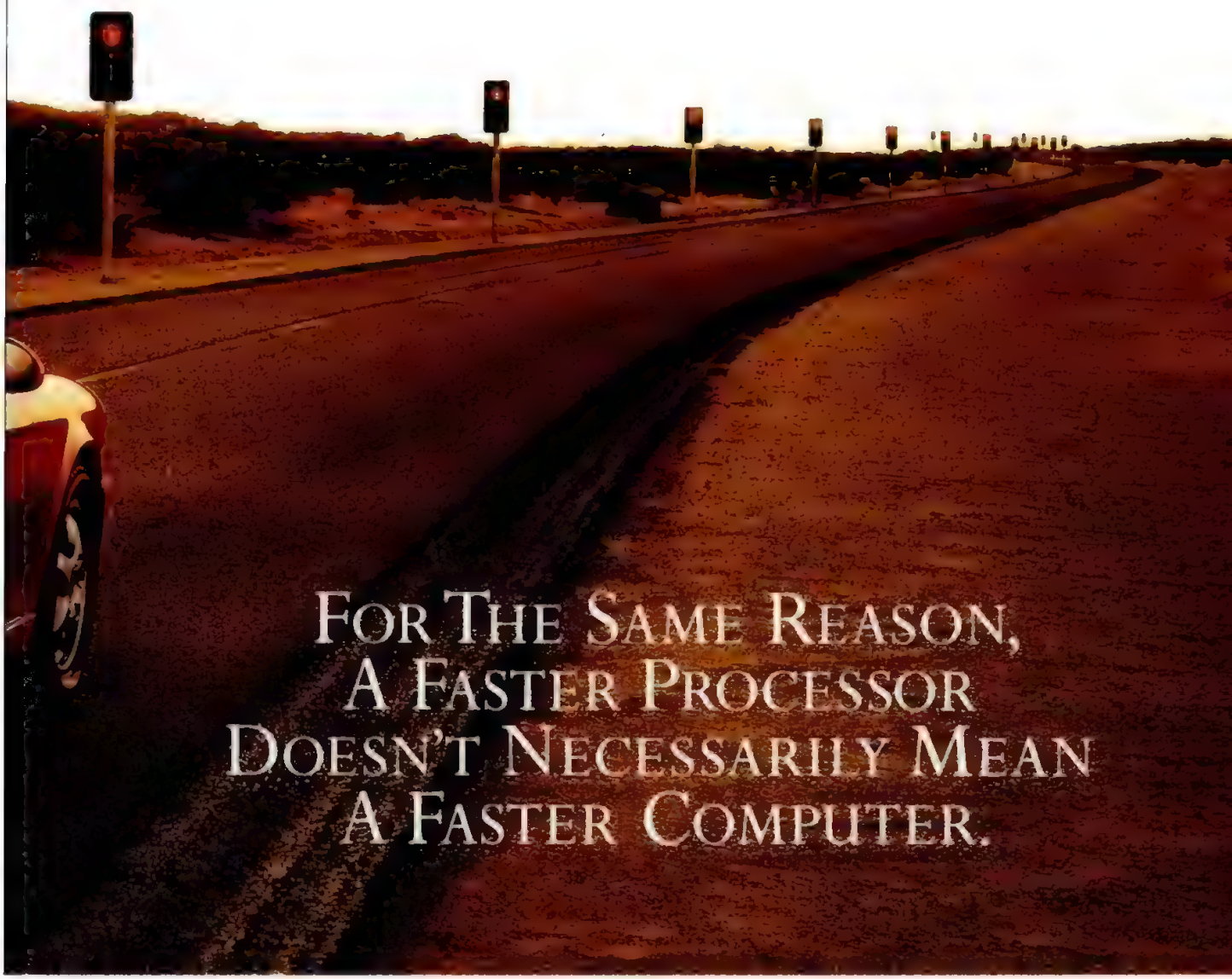


Which is why when our engineers built the all-new Compaq DeskproXE, every subsystem was designed to provide the highest overall system performance.

QVision Local Bus Graphics, for example, offers blink-of-an-eye performance.

intel inside

486SX/33, 486DX2/50, 486DX2/66, 60MHz Pentium • 486 models upgradeable to Pentium technology • QVision local bus graphics with 1MB VRAM • Enhanced Business Audio • Most 486 systems Energy Star compliant • Plug and play ready • 170MB to 525MB Hard Drives • 4MB or 8MB standard RAM (upgradeable to 32MB on 486, 136MB on Pentium) • 4 ISA slots (one reserve) • 3 drive bays • 64K or 256K optional cache • Free 3-year warranty** • Free 7x24 phone support • Deskpro XE 486 models start at $1,499*; Deskpro XE Pentium models start at $3,199*



New hard drives clock in with lightning-like seek times. And all the new Deskpro XE models offer second-level cache options.

For the ultimate in performance, however, we introduce the Deskpro XE with the Pentium processor. Compaq-designed TriFlex/PC Architecture optimizes the tremendous power of the Pentium chip, delivering significantly improved overall system performance. And the Deskpro XE with Pentium starts at just $3,199.*

For complete information on the new Deskpro XE computers, just call us at 1-800-345-1518. And discover why even when they have the same processor, other computers just aren't up to speed.

COMPAQ

©1993 Compaq Computer Corporation. All Rights Reserved. Compaq Registered U.S. Patent and Trademark Office. Deskpro is a registered trademark of Compaq Computer Corporation. QVision, TriFlex, Enhanced Business Audio are trademarks of Compaq Computer Corporation. Porsche and the shape of the Porsche 911 are trademarks of Dr. Ing. h.c.F. Porsche AG. Used by permission of Porsche Cars North America, Inc. *Estimated selling price; actual pricing may vary. **Certain restrictions and exclusions apply. For further details on our limited warranty, contact the Compaq Customer Support Center. Pentium and the Intel Inside logo are registered trademarks of the Intel Corporation

CIRCLE 308 ON READER SERVICE CARD

The impact of SmartDrive can potentially be an improvement of as much as 40 percent for systems with hardware caching controllers and as much as 300 percent for those without. The actual effect on disk benchmark test scores, however, was negligible, raising the question of whether you should bother with the added expense of a hard disk caching controller if you're not short of RAM. Paying attention to the choice of disk and how SmartDrive is configured will help provide a better performance payoff.

DISK WINMARK AND WINSTONE

Because the Disk WinMark test suite is similar to our DOS disk tests, the winners and losers were roughly the same on both groups of tests. Processor performance has slightly more effect, however, on Disk WinMark scores. So the Insight, which fell toward the bottom of the chart on our disk tests under DOS, got a slight lift on our Disk WinMark tests because of its good processor performance; this machine was tied with the HiQ P66, with a Disk WinMark score of 1,350. Though it was the top-scoring unit on our DOS disk tests, the AcerPower placed second on our Disk WinMark tests (1,450), falling just behind the ALR Evolution V (1,470).

The ALR Evolution V's excellent disk performance under Windows helped secure the machine's second-place Winstone score of 86.9. Here, however, it was topped by the HiQ P66, whose fine processor performance helped it post an exceptional Winstone score of 95.

How We Tested

In preparing this issue, we used PC Bench 8.0 to predict processor, video subsystem, and disk performance using DOS applications. The DOSmark is a summary of those three results and estimates system performance under DOS. We also used WinBench 4.0 to obtain Graphics and Disk WinMark scores, and we used the application-based Winstone 94, Version 1.0, to determine system performance under Microsoft Windows 3.1.

The **processor** score gauges the speed of a PC's processor subsystem. The tests measure CPU, RAM, and RAM cache performance and are based on a large instruction mix and either the floating-point coprocessor test or the floating-point emulation test, depending on whether a PC uses a coprocessor.

The **video** score is a weighted harmonic mean of tests that measure 8- and 16-bit VGA write operations involving both text and graphics.

The **disk** score gauges the performance of a PC's disk subsystem, which includes the hard disk, disk controller, and any hardware or software disk caches. The tests work with more than 100 files in six directories totaling over 30MB. The tests include file reads, file writes, file creation, and file deletion in a mix based on typical disk usage.

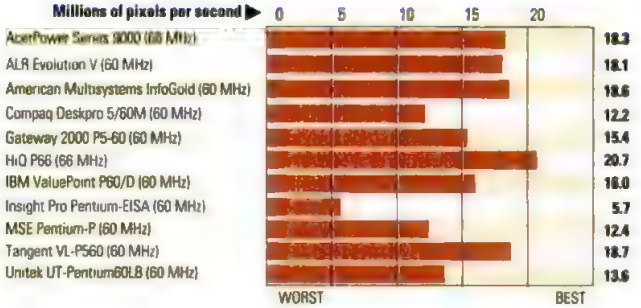
The **DOSmark** score is a composite rating derived from the processor, DOS video, and DOS disk test results. It indicates a PC's ability to run DOS applications quickly and efficiently

The **Disk WinMark** score reflects disk subsystem performance under Windows. The tests use different files and file operations in a blend based on extensive profiling of applications' disk usage.

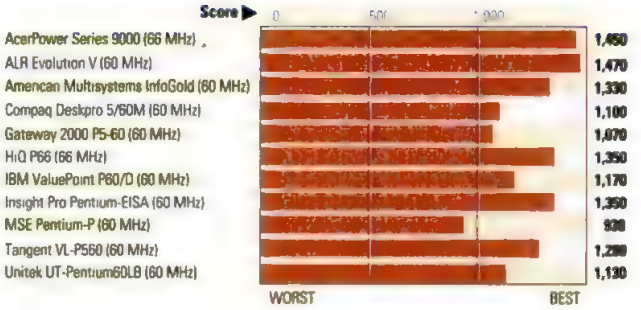
The **Graphics WinMark** score is a measure of PC graphics performance under Windows 3.1. We run 66 different tests—divided into seven graphics test mixes—to evaluate a PC's handling of the Windows GDI (Graphics Device Interface). These tests are based on extensive application profiling. The scores are reported in millions of pixels per second.

Winstone 94, Version 1.0, measures the amount of time a PC takes to execute a set of application scripts that exercise 12 Windows 3.1 applications. Winstone scores have been normalized relative to a 386DX/25-based Compaq Deskpro/M with 4MB of RAM, which has a Winstone score of 10.0.

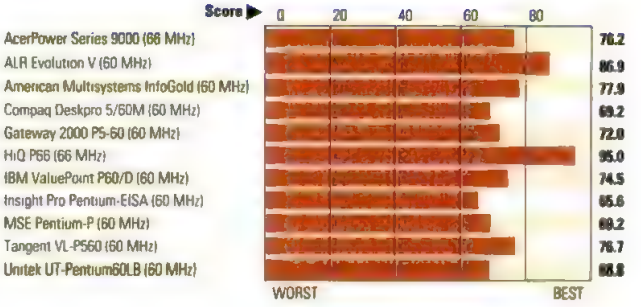
GRAPHICS WINMARK



DISK WINMARK



WINSTONE



Free house calls.

Full coverage.

No deductibles.

Health care reform for PCs

AT&T

NCR

An AT&T Company

Just What The Doctor Ordered.

A worry-free warranty for three full years.

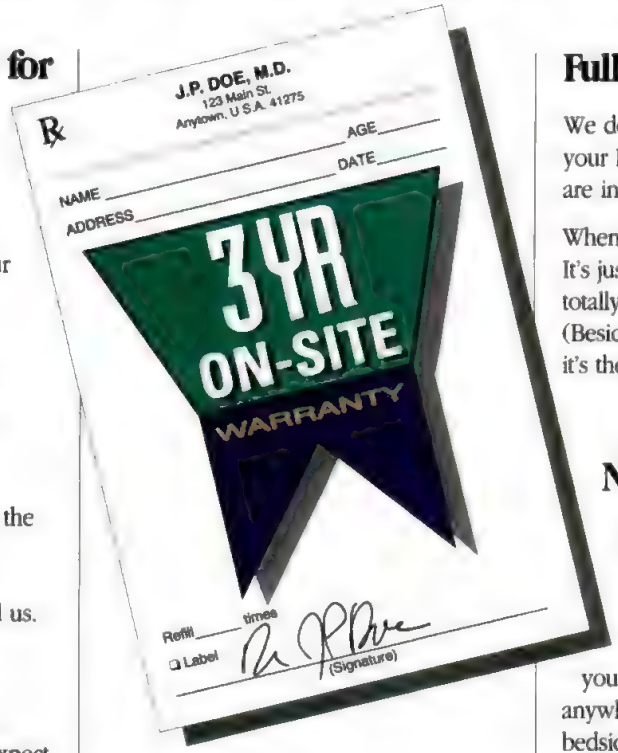
You've got enough worries without having to figure out how to get your PCs fixed. Thanks to NCR, life just got simpler due to our world-class warranty protection.

Only NCR desktop PCs come with a three-year, on-site warranty.

Our desktop warranty is the best in the industry. There's no fine print. No exceptions. Just an old-fashioned promise to be there when you need us.

Free house calls.

House calls for three years? Hard to believe. But what else would you expect from AT&T/NCR? Fact is, we make it down right easy. We come directly to you the next business day. We're there when you need us and not just for the first year...we'll come to you for THREE FULL YEARS.



Full coverage.

We don't scrimp when it comes to getting your PC back on its feet. Parts and labor are included. So's the monitor.

When we say "full coverage" we mean it. It's just one more way to show you we're totally committed to your satisfaction. (Besides, with our product reliability, it's the least we could do.)

No deductibles.

Our desktop warranty has no hidden costs, no upfront service fees. It's absolutely free.

Just think of NCR's warranty as your prescription to the best care anywhere in the United States. (And our bedside manner is darn friendly, too.)

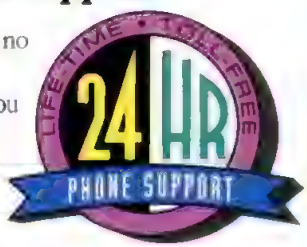
Premium Services.

Superior Support From NCR Service Specialists.

We've been around long enough to know that when something goes wrong, it's important to have someone on-site who knows your system inside and out. That's why we insist on having our own dedicated support staff.

Our warranty is a real dollars and cents commitment to you. It covers all U.S.-installed equipment. We don't expect our systems to bring you anything other than tremendous satisfaction. We've staked our reputation and resources on their quality by giving you a true benchmark for comparison.

24-Hour Toll-Free Techline Support.



That means no more late nights for you at the emergency room. Just call our Techline. It's toll-free, twenty-four hours a day. You'll talk with some of the best-trained folks in the business who will help get your system up and raring to go.

Ask about our 30-Day, no-questions-asked Money-Back Guarantee.

The best way to appreciate an NCR system is to put it through its paces. And, if in a month's time, you find it's just not for you, send it back. We'll refund your money. No questions asked.

We don't want to just satisfy you. We want to delight you.

There's just too much at stake.
A system that meets your needs.
A hard-won reputation for us.

So, we'll do whatever's necessary to make sure your system stays healthy for the days and nights ahead.

AT&T/NCR technology, a worry-free desktop warranty, and superior support services...

Just what the doctor ordered.

(No appointment necessary.)

Healthy Choices.

NCR 486SX/25

$995

Special Call Now! Offer

- ***Intel486 OverDrive Ready***
- Intel486SX/25 (upgradable to 50MHz)
- 3 ISA Expansion Slots/3 Drive Bays
- 120MB Hard Drive (expandable to 1GB)
- 4MB RAM at 70ns (expandable to 32MB)
- External Cache Upgradable to 256KB
- 3.5" Floppy Disk Drive
- 1MB Video RAM
- 14" SVGA VESA Flicker-Free .39mm Monitor

Super 486 Power For Under $1,000! Hurry! Limited Quantities Only!

NCR 486SX/25

$1,290

or

$46/month

- ***Intel Pentium OverDrive Ready***
- Intel486SX/25 (upgradable to 50MHz)
- 3 ISA Expansion Slots/3 Drive Bays
- 120MB Hard Drive (expandable to 1GB)
- 4MB RAM at 70ns (expandable to 32MB)
- External Cache Upgradable to 256KB
- 3.5" Floppy Disk Drive
- VESA Local Bus Video
- Windows TurboCharger Video (Cirrus 5426) w/1MB Video RAM
- 14" SVGA VESA Flicker-Free .39mm Monitor

Performance on a Budget!

NCR 486SX/33

$1,510

or

$1,700

(w/486DX/33)

- ***Intel Pentium OverDrive Ready***
- Intel486SX/33 (upgradable to 66MHz)
- 3 ISA Expansion Slots/3 Drive Bays
- 160MB Hard Drive (expandable to 1GB)
- 4MB RAM at 70ns (expandable to 32MB)
- External Cache Upgradable to 256KB
- 3.5" Floppy Disk Drive
- VESA Local Bus Video
- Windows TurboCharger Video (Cirrus 5426) w/1MB Video RAM
- 14" SVGA VESA Flicker-Free .28mm Monitor

Great For Home Or Office!

NCR 486DX2/50

$2,320

or

$83/month

- ***Intel Pentium OverDrive Ready***
- Intel486DX2/50
- 2 VESA Expansion Slots/4 ISA Expansion Slots
- 5 Drive Bays
- 240MB Hard Drive (expandable to 2GB)
- 8MB RAM at 70ns (expandable to 64MB)
- External Cache Upgradable to 256KB
- 3.5" Floppy Disk Drive
- VESA Local Bus Video
- Windows TurboCharger Video (Cirrus 5426) w/1MB Video RAM
- 14" SVGA VESA Flicker-Free .28mm Monitor

Outstanding Business Workhorse!

NCR 486DX2/66

$3,510

or

$119/month

- ***Intel Pentium OverDrive Ready***
- Intel486DX2/66
- 2 VESA Expansion Slots/4 ISA Expansion Slots
- 5 Drive Bays
- 340MB Hard Drive (expandable to 2GB)
- 12MB RAM at 70ns (expandable to 64MB)
- 64KB External Cache (upgradable to 256KB)
- 3.5" Floppy Disk Drive
- VESA Local Bus Video
- Diamond Viper Video (Weitek P9000) w/2MB Video RAM
- NEC 15" SVGA VESA Flat Screen .28mm Monitor

Graphics Powerhouse!

NCR 486DX2/66

$3,405

or

$115/month

- ***Intel Pentium OverDrive Ready***
- Intel486DX2/66
- 2 VESA Expansion Slots/4 ISA Expansion Slots
- 5 Drive Bays
- 520MB Hard Drive (expandable to 2GB)
- 16MB RAM at 70ns (expandable to 64MB)
- 256KB External Cache
- 3.5" Floppy Disk Drive
- Upgradable to VESA Local Bus Video
- SVGA Server Video (Cirrus 5422) w/512KB Video RAM
- 14" SVGA VESA Flicker Free Screen .39mm Monitor

Fantastic File Server!

All NCR Desktop Systems Include:

Microsoft Mouse, Windows 3.1, MS DOS 6.0

Options:

- **CD-ROM**
- **Fax/modems**
- **Networking cards**
- **Memory/disk upgrades**
- **Printers**
- **A variety of popular applications**

intel inside

MICROSOFT WINDOWS READY TO RUN

Demand the best. Only with NCR.

- **Next business-day service and 24-hour Tech support.**
- **Free 3-year on-site warranty – parts, labor and monitor included.**

AT&T

NCR

An AT&T Company

Call NCR Direct Connect: 1-800-462-3854

NCR products are available through Direct Connect or through your local reseller. Call 1-800-624-7187 for the reseller nearest you.

Healthy Choices For Active People.

Hit the highway with our Road-Ready Systems. They're part of our Mobile Networked Computing strategy that combines NCR's innovative portable technology with AT&T's global communications leadership, like AT&T EasyLink™ Services, a portable communications network. Our notebooks are smaller, lighter, faster and better-connected than ever before.

Safari 3150

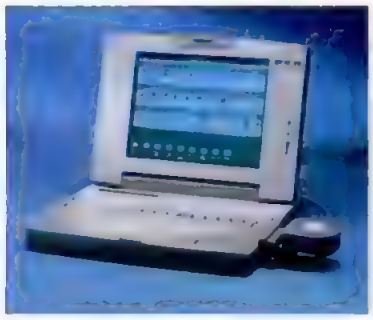
Mono
$1,995
FREE 14" Color ESVGA Monitor!
(with 120MB HD Mono Model only)

Passive Color
$2,995
(Call now for price and availability on active color)

Mono
$3,280
or
$111/month

Active Color
$4,420
or
$149/month

Safari 3180



- Intel486SX/25 (upgradable to 487)
- 120MB Removable Hard Drive (80MB and 170MB available)
- 3.5" Internal Floppy Drive
- 3-4 Hour Battery-life
- 6.1 lbs. (5.5 mono, 6.3 active color)
- 11"x 8.6" x 1.9" (11" x 8.6" x 1.7" mono)
- 9.5" Double-scan Passive Color Screen (TFT Active color and mono also available)
- 4MB RAM (upgradable to 20MB)
- 1MB Video Memory (mono and active 512KB)
- 1 PCMCIA slot (Type 2)
- Local Bus Video
- Dual Video Display
- Front-mounting Cableless Trackball
- Lightweight AC Adapter
- Enhanced Pre-loaded Software: DOS 6.0, Windows 3.1, Bitfax, Tourguide, AT&T Mail, AccessPLUS and on-line Windows documentation
- 3-year Warranty (first year on-site)

Road-Ready accessories

- **AT&T Keep in Touch PCMCIA Modem 14400 data/9600 fax, cellular ready**
- **DataRace™ PCMCIA Modem 2400 data/9600 fax**
- **Cellular Phone Interface Cable**
- **PCMCIA Network Interface Cards: 10BaseT, 10Base2 and WaveLAN**
- **Xircom Network Interface Adapters: 10BaseT, 10Base2 and 10Base5**
- **External Battery Charger**
- **Auto Adapter**
- **Extra Batteries, Hard Drives, Carrying Cases, RAM and Other Accessories Available.**

- Intel486SL/33
- 180MB Removable Hard Drive (250MB available)
- 3.5" Internal Floppy Drive (can be replaced w/2nd battery)
- 3-6 Hour Battery-life (upgradable to 12)
- 6.8 lbs. (6.1 mono)
- 11.7" x 9.3" x 2.1"
- 9.5" TFT Active Color Removable Screen or 9.4" Mono Screen
- 4MB RAM (upgradable to 12MB)
- 1MB Video Memory
- 2 PCMCIA Slots (Type 2) or 1 Slot (Type 3)
- Local Bus Video
- Dual Video Display
- Trackball
- Lightweight AC Adapter
- Enhanced Pre-loaded Software: DOS 6.0, Windows 3.1, Bitfax, Tourguide, AT&T Mail, AccessPLUS and on-line Windows documentation
- 3-year Warranty (first year on-site)

Order AT&T/NCR. We've Made It Easy.

We accept VISA, MasterCard or American Express credit cards. Also, don't forget to ask about your business financing and leasing options through AT&T Capital Corporation.

Hours: 8 AM - 8 PM, Monday through Friday.

Performance, Price, Service, Support.

AT&T | NCR An AT&T Company

Call NCR Direct Connect: 1-800-462-3854

NCR products are available through Direct Connect or through your local reseller. Call 1-800-624-7187 for the reseller nearest you.

NCR is the name and mark of NCR Corporation. AT&T and the AT&T globe design are registered service marks and trademarks of American Telephone and Telegraph Company. The Intel Inside logo, Intel486 and Pentium are trademarks of the Intel Corporation. DOS and Windows are trademarks of Microsoft Corporation. All other trademarks acknowledged. Prices, configuration and availability subject to change without notice. Prices and money-back guarantee do not include shipping. Shipping charges are calculated according to weight and distance. Appropriate sales tax will be added. NCR Corporation is not responsible for errors in typography or photography. © 1993 NCR Corporation.

and the data paths to the processor and memory were optimized for the Pentium, with 64-bit paths to the external cache and main memory. The system is unfortunately limited to 256K of external cache, which won't affect lower-end applications but can be a serious drawback for those users trying to take full advantage of this chip.

The tower case has a front key lock and plenty of room for expansion. There is a total of nine 5.25-inch drive bays, only two of which are in use. The system's case also offers easy access to all parts of the board, which is sure to make upgrades easy.

The system is cooled by three fans, one of which is mounted on the Pentium itself over the heat sink. Motherboard RAM can be expanded to 192MB if you use the largest-capacity SIMMs, but you'll have to replace the two 8MB SIMMs that are already present. Unfortunately, the floppy disk drive and all I/O ports are run off a 16-bit card that takes up another ISA slot.

MS Engineering customizes its systems, offering optional Toshiba CD-ROMs, NEC 17-inch monitors, and SCSI drives. A one-year parts-and-labor warranty comes with the system, but, unfortunately, there is no on-site service available. Technical-support hours are Monday through Friday, 12:00 to 9:00 eastern time, with reduced hours on Saturdays.—*AY*

Tangent Computer Inc.

Tangent VL-P560

Describing itself as more of a "super value-added reseller" than a personal computer manufacturer, Tangent Computer configured a Pentium-based workstation to PC Labs' specifications for an enviable price of $4,995. Tangent feels that its advantage lies in its ability to custom-construct a computer to meet anyone's needs, and the company's Tangent VL-P560 Pentium machine didn't disappoint.

The VL-P560 is constructed entirely by picking and choosing from the offerings of the industry's best third-party component makers, including a Tyan Pentium/VL motherboard, a Matrox

SUMMARY OF FEATURES CONTINUES

Pentium PCs

List price (tested configuration) Unless specified, all prices are list prices for machines as tested by PC Magazine Labs. Some vendors are moving away from set list prices and are using estimated selling prices instead to reflect what a customer would pay.

Dealers/Direct-distribution channel Various machines are sold directly through mail order, through dealers, or through company-owned stores and superstores. For machines sold through dealers, *PC Magazine* views a 15 percent discount off the suggested retail price as typical

The **chip set manufacturer** makes the logic that connects the CPU with the other components managed by the system board

The **BIOS version (or date)** can affect a system's performance on PC Magazine Labs' benchmark tests. A PC with another BIOS may perform differently

Flash memory contains BIOS code that can be updated via software The BIOS is generally stored in conventional ROM, which has no provision for modification

Installable RAM on motherboard indicates the amount of memory that can be installed using any combination of chips and proprietary cards

Cache architecture A *four-way set-associative* cache, native to the 486's internal 8K cache, divides data into four equal blocks and is viewed as the most effective type of cache. A *two-way set-associative* cache's data is split into two equal blocks, and the data in a *direct-mapped* cache (the most common and least costly type of cache) is not divided at all. The Pentium provides two cache paths, for a total of 16K internal cache

Cache write design A *write-back* design can cache data read from and written to main memory. This method is theoretically superior to that of a *write-through* cache, in which only reads from memory are cached, and a *posted write-through* cache, which buffers all writes until the system bus is free before completing them

Accessible drive bays can be reached from the system's front panel and can support removable media (such as tape back-up and CD-ROMs)

Internal drive bays can be reached only by opening the case We report the maximum number of accessible and internal drives a given system can hold (with separate entries for 5 25-inch and 3.5-inch bays).

Floppy disk drives We report the types of floppy disk drives each tested system contains. A *dual* floppy disk drive combines a 1.2MB and a 1 44MB unit inside a single drive bay

Hard disk options We report the range of hard disk capacities the vendor offers for each system

Disk controller location The disk controller can reside on an ISA, EISA, or local-bus expansion card or on the PC's motherboard.

We report the number of **8-bit, 16-bit,** and **32-bit slots** in each reviewed system We also indicate the number of **VESA, PCI,** and **proprietary slots,** as well as the number of **parallel, serial,** and **mouse ports.**

The **display circuitry** can reside on an expansion card or on a PC's motherboard Motherboard circuitry is often faster, but if it cannot be disabled there is no way to upgrade it. For each local bus, we report whether the bus is based on PCI specifications or the VESA (VL-Bus) specification. We are also seeing an increasing number of video systems that rely on a local bus (either proprietary or VESA), as well as PCI systems

DOS 6.0/Microsoft Windows 3.1 are often bundled with vendors' systems, and we indicate whether these software packages come standard with each reviewed unit We have also begun to see packages bundled with DOS 6.1. A *yes* bullet for DOS implies DOS 6.0, except where otherwise indicated

The **on-site service charge** may be included in the price of the system; otherwise, it may be a set or variable added cost. If the charge varies, it is often determined by the system's configuration and cost Several PC vendors do not sell on-site contracts

▶ SUMMARY OF FEATURES

Pentium PCs

PC MAGAZINE

Products listed in alphabetical order ■ = YES □ = NO	AcerPower Series 9000	ALR Evolution V	American Multisystems InfoGold Pentium 60 NT	Compaq Deskpro 5/60M	Gateway 2000 P5-60	HIQ P66 Pentium Graphics Ultra Station	IBM ValuePoint P60/D	Insight Pro Pentium-EISA
List price (tested configuration)	$5,550	$5,004	$4,999	$8,758 (estimated)	$3,595	$4,318	$5,479	$4,699
Processor type and speed (MHz)	Pentium/66	Pentium/60	Pentium/60	Pentium/60	Pentium/60	Pentium/66	Pentium/60	Pentium/60
Hard disk capacity	520MB	535MB	540MB	510MB	425MB	524MB	527MB	525MB
Dealers/Direct-distribution channel	■■	■■	■■	■□	□■	■■	■■	□■
Case style	Desktop	Small-footprint	Tower	Desktop	Tower	Tower	Desktop	Desktop
Bus architecture	EISA/VESA	ISA/VESA	ISA/VESA	EISA	ISA/PCI	ISA/VESA	ISA/PCI	EISA
Power supply (and number of connectors)	200W (4)	200W (6)	230W (4)	240W (5)	300W (7)	250W (6)	200W (6)	250W (6)
Motherboard and CPU								
Motherboard manufacturer	Acer	ALR	ALR	Compaq	Intel	TMC	AMI	Intel
Chip set manufacturer	OPTi	OPTi	OPTi	Compaq	Intel	OPTi	Intel	Intel
BIOS version (or date)	Acer (8/18/93)	Phoenix 1.02.01m	Phoenix 1.02.01m	Compaq (4/28/93)	AMI 1.05 (beta)	AMI (11/11/92)	AMI (11/11/92)	Phoenix (11/10/92)
Flash memory	■	■	■	□	■	□	■	■
Memory and Processor RAM Cache								
Installable RAM on motherboard	8MB–128MB	8MB–128MB	4MB–128MB	8MB–136MB	2MB–128MB	2MB–128MB	16MB–128MB	2MB–374MB
Installed external cache	512K	256K	256K	256K	256K	512K	256K	256K
Cache architecture	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	Two-way set-associative
Cache write design	Write-back	Write-back	Write-back	Write-through	Write-through	Write-back	Posted write-through	Write-back
Disk Drives								
Accessible drive bays (5.25", 3.5")	3, 1	2, 1	4, 0	3, 0	4, 1	4, 0	2, 1	2, 0
Internal drive bays (5.25", 3.5")	0, 1	0, 1	0, 3	1, 0	0, 3	3, 0	0, 2	1, 1
Floppy disk drives	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB
Hard disk options	340MB–1GB	170MB–1.37GB	340MB–1.7GB	240MB–1GB	80MB–1GB	240MB–2GB	170MB–527MB	80MB–3GB
Disk controller location	Motherboard	VL-Bus card	VL-Bus card	Motherboard	Motherboard	VL-Bus card	Motherboard	EISA card
Bus Structure								
Expansion bus: 8-bit, 16-bit, 32-bit slots	0, 0, 6	0, 3, 0	0, 3, 0	0, 0, 5	0, 5, 3	0, 5, 0	0, 3, 0	0, 0, 6
Local bus: VESA, PCI, proprietary slots	2, 0, 1	3, 0, 0	3, 0, 0	0, 0, 2	0, 3, 0	3, 0, 0	0, 2, 0	0, 0, 0
Parallel, serial, mouse ports	1, 2, 1	1, 2, 1	1, 2, 1	1, 2, 1	1, 2, 1	2, 2, 0	1, 2, 1	1, 2, 1
Integrated network port	None	None	None	None	None	None	None	None
Video								
Display circuitry location	VL-Bus card	VL-Bus card	VL-Bus card	EISA card	PCI local-bus card	VL-Bus card	Motherboard PCI local bus	Motherboard
Video chip set manufacturer	Weitek	ATI	Matrox	Compaq	ATI	Weitek	ATI	WD
Miscellaneous								
DOS 6.0/Microsoft Windows 3.1 included	■■	■■	■■	■■	■■	■■	■* ■	■■
Warranty	1 year	5 years parts, 15 months labor	1 year	3 years	1 year	1 year parts, 2 years labor	1 year	1 year
On-site service charge	Included (1 year)	$9.95 (1 year)	N/A	Included (1 year)	Included (1 year)	N/A	Included (1 year)	N/A

N/A—Not applicable: The product does not have this feature.
* The product comes with DOS 6.1.
ALR–Advanced Logic Research Inc., ATI–ATI Technologies Inc., WD–Western Digital Corp.

graphics controller, and a BusLogic SCSI hard disk controller. Even the monitor (which carries a Tangent label) is purchased from a large monitor manufacturer. There are many vendors who are in the business of selling systems built from third-party components; what makes Tangent stand out from the crowd is that its combination performs competitively both on our benchmark performance tests and in the marketplace as well.

▶ Tangent VL-P560

SUITABILITY TO TASK	
DOS applications	FAIR
Windows applications	GOOD
Expandability	GOOD

On our benchmark tests, Tangent's entry was generally stronger under the Windows environment than under DOS. Its DOSmark and DOS video scores were the lowest of the group, and its processor score was barely average. But the unit's SCSI-2 hard disk subsystem managed competitive scores under both DOS and Windows, while the Matrox-based VL-Bus video card contributed to this unit's above-average Graphics WinMark score. A solid Winstone score was further testimony to the VL-P560's impressive performance under Windows.

But though its scores on our performance tests were generally good, the VL-P560 was lacking in the system layout and packaging departments. Though the standard desktop case certainly had enough drive bays, they blocked access to system memory. Cabling was messy, too, and Tangent's choice of monitor—a CTX 4568A 14-inch unit with a 60-MHz refresh rate at a maximum resolution of 800-by-600—left a lot to be desired. The company does, however, offer bigger and better name-brand displays.

The Tyan motherboard supports a 64-

MSE Pentium-P	Tangent VL-P560	Unitek UT-Pentium60LB
$3,995	$4,995	$3,695
Pentium/60	Pentium/60	Pentium/60
510MB	343MB	524MB
□■	■■	□■
Tower	Desktop	Tower
ISA/PCI	ISA/VESA	ISA/VESA
200W (6)	200W (6)	250W (7)
Asustek	Tyan	Tyan
Intel	OPTi	OPTi
Award 4.5	AMI (11/11/92)	AMI (11/11/92)
□	□	■
4MB–192MB	2MB–128MB	8MB–128MB
256K	512K	512K
Four-way set-associative	Two-way set-associative	Direct-mapped
Write-back	Write-back	Write-back
6, 0	3, 0	6, 0
3, 0	0, 3	3, 0
Dual	1.2MB, 1.44MB	1.2MB, 1.44MB
250MB–2GB	240MB–2.1GB	340MB–3.4GB
ISA card	VL-Bus card	VL-Bus card
0, 5, 0	0, 5, 0	0, 5, 0
0, 3, 0	3, 0, 0	3, 0, 0
1, 1, 0	1, 2, 0	2, 2, 0
None	None	None
PCI local-bus card	VL-Bus card	VL-Bus card
Weitek	Matrox	Weitek
■■	■■	■■
1 year	1 year	1 year parts, lifetime labor
N/A	Included (1 year)	Included (1 year)

bit path to both DRAM and the external cache, and it can also handle a cache of up to 2MB. It is capable of accepting either a 60-MHz or 66-MHz Pentium—a good thing, because Tangent expects to sell the 66-MHz chip in volume by the end of the year.

Documentation could stand upgrading, however, since it presently consists of only a photocopied version of the Tyan technical specifications, the installation guides for the BusLogic and Matrox controllers, and the monitor's user manual.

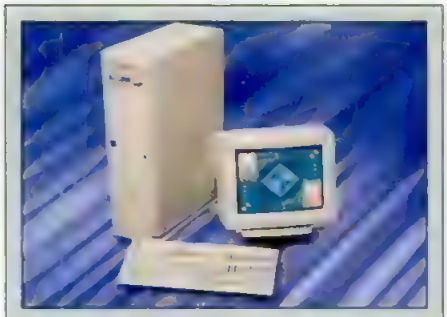
Tangent sells all its PCs with a one-year parts-and-labor warranty complete with free on-site service and with toll-free technical support six days a week. Tangent will also preinstall a variety of high-end software packages on your machine should you request it.—*OR*

FACT FILE

Tangent VL-P560
Tangent Computer Inc.,
800-800-5550, 415-342-9388

List price (tested configuration): $4,995
Memory and processor RAM cache: 16MB 60-ns SIMMs, 512K external cache.
Disk drives and controller: Seagate ST3990N 19-ms 343MB SCSI-2 hard disk with 256K cache, 1.2MB and 1.44MB floppy disk drives, BusLogic BT 445S rev n VESA local-bus-card disk controller with 32KB cache
Display: Matrox MGA Ultima VESA local-bus-card video controller with 2MB video RAM, CTX 5468A 14-inch monitor with a 60-Hz refresh rate at 800-by-600 resolution.
Software: DOS 6.0, Microsoft Windows 3.1.
In short: The Tangent VL-P560 can be custom-configured as the user requires in a wide variety of end uses. The system not only managed to produce decent performance scores on our benchmark tests (though mainly under Windows) but is offered at a competitive price as well.

ON READER SERVICE CARD 450



FACT FILE

UT-Pentium60LB
Unitek Technology Inc.,
800-944-5650, 909-930-5700

List price (tested configuration): $3,695
Memory and processor RAM cache: 16MB 70-ns SIMMs, 512K external cache.
Disk drives and controller: Quantum ProDrive LPS 525AT 17-ms 524MB IDE hard disk with 512K cache, 1.2MB and 1.44MB floppy disk drives, Promise DC-4030VL VESA local-bus disk controller with 2MB cache
Display: Diamond Viper VLB VESA local-bus video controller with 2MB VRAM, ViewSonic 15 1564 15-inch monitor with a 72-Hz refresh rate at 1,024-by-768 resolution.
Software: DOS 6.0, Microsoft Windows 3.1.
In short: Unitek Technology's entry carried one of the lowest prices that we encountered in this roundup. But even with well-known components, the UT-Pentium60LB just couldn't keep pace with the rest of the pack.

ON READER SERVICE CARD 451

Unitek Technology Inc.

UT-Pentium60LB

At $3,695, Unitek Technology's UT-Pentium60LB is one of the lowest-priced Pentium-based PCs on the market today. Unfortunately, even though the company packed an impressive array of name-brand components into a large and robust tower case, the Pentium60LB managed only mediocre performance scores.

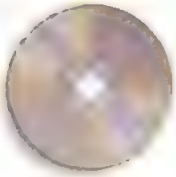
Unitek, like Tangent Computer, specializes in configuring PCs from third-party components. In its Pentium60LB, Unitek included the same Tyan motherboard found in the Tangent VL-P560; a ViewSonic 15 1564 display; a Promise VL-Bus IDE hard disk controller with 2MB of cache; and a Diamond Viper VLB graphics card. The unit came in a full-size tower case with nine drive bays.

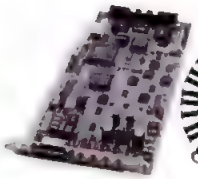
Even with all these well-known components in place, however, Unitek's Pentium60LB just couldn't keep pace with the rest of the pack. The unit logged the lowest score in this roundup on the processor benchmark tests

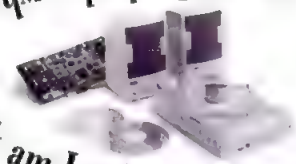
UT-Pentium60LB

SUITABILITY TO TASK	
DOS applications	GOOD
Windows applications	GOOD
Expandability	EXCELLENT

In desperation I asked my friend about Multimedia. She said it's simple. To turn your computer into a multimedia funhouse you need an award-winning Pro AudioSpectrum™ 16 sound card. Sounds great I said. But she wasn't done. I should also get a great CD-ROM drive and a pair of amplified speakers so I can walk through the jungle, talk to Columbus or even explore a haunted house. And all this stuff should be easy to use and set up in my computer automatically. So I asked—where the heck am I going to find all this in one affordable package?







MEDIA VISION

NOW THAT'S MULTIMEDIA!

Fusion DoubleCD™ 16 — The Complete Multimedia Kit.

Call 1-800-845-5870 for information or a dealer near you. © 1993 Media Vision, Inc., 47300 Bayside Parkway, Fremont, CA 94538. (510) 770-8600. Fax (510) 770-9592. Pro AudioSpectrum and Fusion DoubleCD 16 are trademarks of Media Vision, Inc. Any other trademarks are owned by their respective holders. Any and all bundled software subject to change without notice.

CIRCLE 093 ON READER SERVICE CARD

and, despite good video and disk scores, only managed an average DOSmark score.

The Pentium60LB's Winstone score was one of the lowest—just barely higher than that of the Insight entry. The unit's Diamond Viper VLB graphics card managed a decent video score as did the system's hard disk subsystem. But even these couldn't pull together enough to make the system a screamer among Pentium-based PCs.

HIGH-END, LOW PRICE

On the bright side, however, this machine offers a number of high-end, name-brand components as well as Pentium-level performance for about $1,000 less than what most other vendors in this review are asking.

Unitek's motherboard handles up to 128MB of system memory, provides a full 64-bit path to memory and cache, and lets you expand external cache to a whopping 2MB.

The Tyan motherboard handles up to 128MB of on-board memory and takes full advantage of the Pentium chip's design by providing a full 64-bit path to memory and cache. You can expand the external processor cache to a whopping 2MB.

Unitek keeps the main processer chip cool by providing two fans in addition to a heat sink. The ViewSonic monitor supplies brilliant color and can store 26 user-definable settings.

Further, like Tangent Computer, Unitek will configure a machine to your specifications. High-resolution monitors are available in sizes up to 21 inches, and hard disk storage can be increased to as much as 3.4GB. In addition, Unitek also offers a wide selection of CD-ROM drives, sound cards, multimedia bundles, and other peripherals. This is a great comfort to those users who feel more comfortable going back to the original purchase site for further purchases or questions.

Unitek's documentation for this system was not quite up to par. Only technical specifications were provided for the individual components, and the users manual was a somewhat condensed DOS and Windows tutorial. Many companies use this condensed format for their manuals because documentation for the individual components is sufficiently in-depth.

Unitek Technology sells in the direct market only, but it includes an attractive one-year-parts, lifetime-labor warranty and free-on-site service for the first year.—*OR*

With Backpack's unique printer port connection, family support has never been easier.

Adding additional storage to your IBM compatible, laptop or notebook has never been easier. The *backpack*™ family of no-slot drives plugs directly into your parallel printer port to provide you with additional storage instantly. Using them one at a time, or daisy chaining up to four together, there are no interface cards to install so you don't have to open the cabinet of your computer. And because your printer attaches directly to the *backpack* drive, you don't have to disrupt your print operations. With the *backpack* family of diskette, hard, tape or CD-ROM drives, you can easily transport your information wherever you go—just plug *backpack* into the parallel printer port of any IBM compatible or portable. And, of course, all *backpack* drives work with Windows.™ With *backpack*, there's no hassle. Just sit back and enjoy the new member of the family.

Just plug and play. It's the no-hassle approach to additional storage.

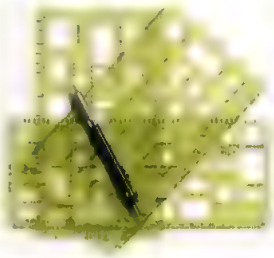
MicroSolutions

132 W. Lincoln Hwy. DeKalb, Illinois 60115 Telephone 815.756.3411 FAX 815.756.2928
Call Toll Free 800.293.1214

CIRCLE 855 ON READER SERVICE CARD

Visio 2.0 is the easiest way to make great business drawings.

Now, it's also the easiest way to make a great business decision.



If you've used a stencil, you know how to use Visio. Visio stencils address virtually all your business drawing needs.

You're looking at some great drawings and diagrams made by a bunch of people who can't draw.

All were created with Visio,™ Shapeware's® award-winning drawing program for Windows™ 3.1 users.

Visio provides job-specific, on-screen stencils for easy access. So instead of drawing, you simply select SmartShapes™ from one of 20 stencils, and drag and drop them into place.

Unlike clip art, Visio's 600-plus SmartShapes have built-in intelligence. So they resize without distorting, connecting lines stay glued and integrated text makes labeling and editing a snap. You can even create and customize shapes of your own.

Visio's drag and drop SmartShapes take the "drawing" out of business drawing.

And since Visio supports OLE 2.0, you can easily integrate drawings with other Windows applications. Creating great business drawings has never been simpler.

$129

For a limited time, buy Visio 2.0 for just $129.

Here's an easy business decision: Purchase Visio 2.0 while supplies last and save $170. Visio also comes with a 60-day, money-back guarantee. To order, for more information, or for the names of authorized Visio resellers near you, call toll-free:

1-800-446-3335, ext. BP9

SHAPE WARE

© Shapeware Corporation, 1994. All rights reserved. Outside the U.S. and Canada contact Shapeware by phone (303) 743-9533 or fax (303) 695-0555. Offer applies to versions for use in the U.S. and Canada only. Offer price is in U.S. dollars. Shapeware is a registered trademark and Visio, Drag and Drop Drawing for Everyday Graphics, and SmartShapes are trademarks of Shapeware Corporation. Windows is a trademark of Microsoft Corporation.

CIRCLE 006 ON READER SERVICE CARD

ILLUSTRATION SOFTWARE

A Picture in Time

Illustration software has become more powerful—and more volatile—than ever. The four packages we review are evolving rapidly.

by Luisa Simone

Anyone who has ever taken a life drawing class has tried his or her hand at gestural drawing—a technique in which the model continues to move as the artist sketches. At their best, these drawings, which must be completed quickly, capture the essential line as it exists in a single moment of time. Any discussion of professional illustration programs today is no more than a gestural drawing, because the technology continues to move even as we attempt to describe it.

The rapid pace of this change has several ramifications. Most immediately, it determines which programs we review in this story. Three of the four products reviewed here—Canvas for Windows, Version 3.5; CorelDRAW, Version 4.0; and Micrografx Designer, Version 4.0—are substantially revised or wholly new programs. The fourth product, Adobe Illustrator for Windows, Version 4.01, has not been revised but is included because it received an Editors' Choice award in our last roundup ("Professional Illustration: In Pursuit of Truth and Beauty," March 30, 1993). Version 5.0 of

IN THIS REVIEW

Adobe Illustrator for Windows.....164
Canvas for Windows.....177
CorelDRAW.....186
Micrografx Designer.....188

Illustration by Richard Tuschman

Illustrator is a Macintosh-only product. Adobe is planning a Windows version, one that will share a code base with its Mac sibling, but no release date has been announced. Two other products, Aldus FreeHand, Version 4.0, and Gold Disk's Professional Draw, Version 2.0, are previewed in the sidebar "Upcoming In Illustration" because these new versions are not yet shipping. The new version of Arts & Letters Graphics Editor is in an even more amorphous state—no code was available for a preview.

On a more practical level, the rapidly moving market has forced illustration software developers into a features war. We knew when we established our review criteria that most of the programs had already far surpassed our minimum requirements, which included a list price of under $1,000, robust Bezier editing tools, the ability to place text along a freeform path, support of either Adobe Type 1 or TrueType fonts, object-management functions such as layering or locking, import and export of standard file formats such as EPS and TIFF, and four-color separation generation as either DCS or PostScript files.

Going beyond the filter, Micrografx Designer still defines itself as a 2-D illustration program, even though it now sports true 3-D drawing tools such as extrusion and lathing. Don't confuse this with CorelDRAW's extrusion or perspective functions, which can produce only the illusion of a third dimension. Designer's 3-D objects are as solid as those produced with any 3-D modeling program and can be rotated in space and cast real shadows. No one can accuse the programmers at Corel of slacking off, however. CorelDRAW adds fractal textures, a calligraphic effect called PowerLines that can mimic pressure sensitivity, and named styles for text *and* objects. Even a relatively low-cost program like Canvas provides powerful tools. Canvas's Smart Mouse function, for example, enables you to define and simultaneously use multiple drawing constraints—a feature more common to high-end drafting products (such as the Ashlar Vellum packages).

UPPING THE ANTE

Despite the differences between these programs, there are some noticeable trends. From a marketing point of view, Canvas, CorelDRAW, and Designer all attempt to deliver extra value on the dollar. Canvas does so by lowering its price to only $399. Designer and CorelDRAW take a different approach by offering CD-ROM disks that contain literally hundreds of fonts and thousands of clip art images. CorelDRAW has proven that this strategy appeals to business users. But whether it will attract professional illustrators, who may already own a complete type library or may scorn canned clip art, remains to be seen. Still, in such a competitive market, value is important.

In addition to fonts and clip art, three of the four programs in this roundup come bundled with other programs. With CorelChart, CorelMosaic, CorelMove, CorelPhoto-Paint, CorelShow, and CorelTrace, there is no denying that CorelDRAW is king of the hill where bundles are concerned. But you shouldn't overlook older programs such as Adobe Illustrator, in which external utilities can supplement aging toolsets or provide specialized—and superior—capabilities. Adobe TypeAlign, for example, compensates for Illustrator's

PC MAGAZINE ▶ EDITORS' CHOICE

- **CorelDRAW, Version 4.0**
- **Micrografx Designer, Version 4.0**

Proceed with caution. While both of our Editors' Choices will ably assist you in completing a multitude of illustration tasks, both come with caveats. These are powerful, feature-rich packages, but this power comes with overhead. In each case, our warning is "be patient." CorelDRAW, Version 4.0, is slow and Micrografx Designer, Version 4.0, has some bugs to work out.

Long an artistic illustration champion, CorelDRAW still gives you everything you need to be creative—and then some. Its new PowerLines, an attempt to simulate calligraphic pen strokes, are flexible and unique: The package maintains them as lines rather than as objects. And when it comes to creating 3-D backgrounds and scenes, CorelDRAW's Perspective effect is first-rate. By allowing you to align the vanishing points of numerous objects, the package makes it possible to create the consistent illusion of 3-D space. Fills, another of CorelDRAW's long-running strengths, have been enhanced with new options, including tools for creating multiple-color gradient fills and the addition of 45 editable fractal fill patterns.

CorelDRAW's desktop publishing features have also been enhanced. The package now allows you to create documents of up to 999 pages, to view two-page spreads, and to link text frames across pages. Besides these capabilities, you get the added value of the many Corel modules, including Mosaic, Move, and Photo-Paint.

Despite this richness, CorelDRAW can't be recommended to folks in a hurry. It's incredibly slow when loading blocks of text. And because CorelDRAW maintains control points for every character in a block of text (allowing you to kern them individually), every text adjustment means you'll have time to kill while you wait for the screen to redraw. Color illustration redraws are almost as tedious.

A NEW DESIGNER

Those of you who thought you knew Micrografx Designer—think again. Version 4.0 is a total reworking of the Designer of old, bringing with it a new interface, entirely new code, a handful of fine new features, and, unfortunately, some performance flaws.

Designer has managed to remain a powerful performer with a strong set of precision illustration tools, but now these tools have become accessible via a

clean interface that is reminiscent of Picture Publisher, its image-editing sibling. Highlights of this new interface include contextual menus that appear with a click of the right mouse button, a context-sensitive ribbon bar, fly-out menus, and a more sophisticated customizable toolbox.

Designer's text handling has also been improved to the point where it's now the package to use for creating design-intensive, single-page layouts. It currently supports automatic text-on-a-path, flowing text around or within objects, and DTP-like block text operations. Creating multiple-column, complex documents is a breeze thanks to an overflow indicator that automatically creates columns of the proper dimension when your text exceeds the block you've created. It's less useful for designing long documents since it can't flow text across pages and it doesn't support named styles.

The most glamorous of the new features, though, is Designer's ability to create true 3-D objects. Whereas other packages, such as CorelDRAW, allow you to extrude 2-D objects to create the semblance of 3-D, Designer lets you work with true 3-D space. This allows you to rotate objects around all three axes and to apply lighting effects to achieve perspective. The package doesn't give you the ability to perform operations on multiple 3-D objects, however, which makes creating a scene with perfect perspective difficult.

With all these enhancements come some growing pains, however. While its text redraws are quicker than CorelDRAW's, Designer is no speed demon. More serious drawbacks include occasional erratic performance and features (such as drop caps) that just don't work as advertised. Some of these problems are expected to be fixed with a slipstream release that should be shipping by the time you read this.

WORTH MENTIONING

Honorable mention goes to a newcomer in the category, Deneba Software's Canvas for Windows, Version 3.5. A veteran on the Macintosh, this new Windows package gives you a strong set of drawing tools and intelligent technical illustration functions. Add in a modular design that lets you load a subset of the full toolset to conserve system resources and a modest $399 price, and you have a true competitor. The drawbacks here are export filters that don't work particularly well and the program's inability to edit special effects dynamically. The export problems should be fixed by the time you read this.

The fourth package in this review, Adobe Illustrator is still a solid performer, but is badly in need of some modernization. A new version of this old favorite is in the works, but no release date has been set. Be on the lookout for new versions of Aldus Freehand and Gold Disk's Professional Draw, both of which look to be strong competitors.

limited text effects with easy-to-use text-warping functions. And Adobe Separator produces great four-color separations in large part because it is built around Adobe's rational screen technology. Micrografx has also jumped onto the bundling bandwagon by shipping PhotoMagic for Windows (an entry-level image-editing program) and SmartSep (a color-separation utility) with Designer.

Even if you put the issue of bundled programs and the functionality they provide to the side, you'll notice that illustration programs have broadened their scope to appeal to a wider variety of users. This everything-but-the-kitchen-sink approach to product design has its ups and downs. If your design needs are modest, you may never need to buy another graphics program. All of the programs reviewed here offer at least rudimentary desktop publishing tools, but you can also find built-in screen-show capabilities, charting tools, and basic animation functions. And in response to the new breed of diagrammatic drawing programs, such as Shapeware Corp.'s Visio and Aldus IntelliDraw, several programs have added features such as smart connectors and database functions geared specifically toward the creation of flowcharts, orgcharts, and floor plans.

On the down side, all of this functionality has a price, which is measured not in dollars but in the currency of performance. Both CorelDRAW and Designer are harbingers of the future, when bigger-than-ever programs will require faster processors, as well as lots of hard disk space and memory. Users have noticed a performance degradation with Designer running on a 386. And CorelDRAW's text redraws are still frustratingly slow. In this regard, only Canvas deserves kudos for its modular structure, which allows you to install only those functions you need and want.

THE PROBLEM WITH POWER

As the programs become more powerful, the images they produce get more complex and proportionately more difficult to print. That's because the spectacular special effects, such as extrusions, warps, and multiple-color gradient fills, must ultimately be translated into the PostScript printer language. We discovered that PostScript Level 2 is robust enough to handle the most demanding print jobs. But if you're working with a PostScript Level 1 device, be prepared to either live with error messages or learn how to optimize your drawings for PostScript output. (See the sidebar "Efficient PostScript Printing" for an exploration of common PostScript problems and their solutions.)

More seriously, all of the new products—Canvas, CorelDRAW, and Designer—have been plagued by bugs at release time. During the course of our testing, we experienced everything from repeatable GPFs to corrupted files. While our testing script was not specifically

Our Contributors: LUISA SIMONE is a contributing editor to *PC Magazine*. LORI GRUNIN is a former associate editor of *PC Magazine* and is a frequent contributor. CAROL ELLISON and DON LABRIOLA are frequent contributors to *PC Magazine*. GAYLE C. EHRENMAN was the associate editor in charge of this story, and JEFF MACE was the project leader.

Suitability to Task: Illustration Software

No longer is it enough for a professional illustration package to offer sheer power. The most jam-packed toolbox won't do you any good at all if you can't figure out how to make those tools work. For that reason, and to keep up with the growing demands of our readers, we have adopted a new approach for rating Suitability to Task. Instead of giving a product a single rating in each of three categories that reflects a combination of both power and usability, we give each product two separate ratings in each category: one for the power and depth of its offerings and another for its ease of use.

For a package to be truly useful for **artistic illustration,** it must give you a variety of ways to achieve your desired results. The illustration tools must be plentiful, powerful, and flexible. Text and type handling are next on the list of required features. A package must allow you to import, format, and adjust the leading and kerning of your text easily. Special effects for display type and paragraph controls for body type are essential as well. And to achieve your artistic ideal, you'll want special effects options like extrusion, warp, blend, and perspective, along with sophisticated color-handling options, including a variety of fill types, and the ability to mix and manage colors from a variety of color models and matching systems Finally, these tools must be easy to use as well.

For **technical illustration,** we rate a package's suitability for precision illustration tasks. The ability to assign exact numeric measurements to elements, create scale drawings, measure and constrain angles, carefully control drawing tools, and create dimension lines are all important here. To be a truly useful tool for precision drawing, a package must also provide strong object-handling options, including an easy-to-use layering scheme, as well as flexible rulers, grids, and snap options. Strong duplication and transformation tools, such as rectangular and circular arrays and precision rotations, as well as the ability to save and reuse object attributes, also come in handy. In addition, we consider a program's ability to import and export .DXF files for use in a CAD package.

Our **color publishing** task focuses on a program's suitability for producing printed color output of your illustrations. Support for calibration routines, PostScript Printer Description (PPD) files, and color-matching systems that make it possible to match your on-screen display to your printed output are important considerations. Strong color PostScript support and the ability to handle such printing-related tasks as registration marks, spot- and four-color separations, batch printing, and gray-color and under-color removal, as well as the ability to perform dot-gain compensation, are also vital for creating attractive output.

SUITABILITY TO TASK

Product Name	POWER	EASE
Artistic illustration	Poor	Excellent
Technical illustration	Fair	Good
Color publishing	Good	Fair
Color publishing	Excellent	Poor

designed to uncover bugs, it was intended to push the programs to their limits. The mock advertisement is the showpiece of our testing script and includes everything from autotracing to desktop publishing functions to artistic illustration tools and special effects.

Perhaps it is unreasonable to expect a beta testing cycle to uncover every possible problem when software is as complex as these products are. However, a pattern seems to be emerging in which the first few months of a product's life cycle include important fixes and amended version numbers. The current release of CorelDRAW, which has been on the market since mid-1992, is officially up to Version 4.00B3, and you can expect to see similar updates for both Canvas and Designer.

Despite their individual shortcomings, all of these illustration packages produce beautiful drawings, so choosing among them is difficult. Even the admittedly out-of-date Adobe Illustrator offers real benefits. Its limitations are basically a reflection of how closely it's tied to the PostScript printing language. And CorelDRAW's position as the easiest program to use is now being challenged by both Canvas and Designer. Whereas CorelDRAW features roll-up menus (or *floating palettes*), Canvas offers tear-off toolboxes. And Designer's totally revamped interface uses a toolbox and toolbar in combination, so picking and configuring drawing tools is easy while keeping the work area uncluttered.

This entire discussion of features and functions begs an essential question: "Who are these programs designed for?" On one level the answer is simple: professional illustrators who have the time to learn the nuances of each tool and the talent to draw pretty pictures. Increasingly, however, these programs target high-level business users and amateur artists, who rely upon special effects, automated functions, and streamlined interfaces to produce professional-looking drawings even though they are not professional artists.

Adobe Systems Inc.

Adobe Illustrator for Windows, Version 4.01

BY DON LABRIOLA

Flexible drawing and type-manipulation features and superbly accurate color output have long made Adobe Illustrator, Version 4.01, a favorite among professional designers. But in the three years since its last major upgrade, this $695 package has begun to lag behind the competition both in high-end features and in the single-click functionality favored by a growing number of nonprofessional users. Though this package is still a formidable heavyweight, it's not quite the championship contender that its predecessors were.

Illustrator isn't a one-size-fits-all graphics suite like CorelDRAW. It's intended to do one thing well: provide professional illustrators with the ability to create and print high-quality artwork. Instead of including paint and presentation software, Illustrator is bundled with the Adobe Type Manager, Separator, Streamline, and TypeAlign programs, which provide type-manipulation, tracing, and color-separation functions useful to artists. The program also offers 40 Adobe Type 1 fonts and a 300-piece library of no-nonsense clip art and symbols.

Despite its many strengths, Illustrator has never been easy to learn. It's a complex program dense with dialog boxes and

IBM

There was a time you couldn't expect onsite service if your site was as remote as this.

Jay Pancost
IBM Customer Engineer

To IBM Customer Engineer Jay Pancost, going the extra mile often means exactly that. His service calls take him to homes and offices from the Grand Canyon to the Hopi and Navajo reservations. "When you buy a PC," he says, "the company that made it should be there for you when you need them. I like the idea of a job where people are always glad to see me, even if they're sometimes surprised I would go so far off the beaten path." Wherever you may be, there are more than 10,000 IBM service representatives like Jay Pancost, in over 1,600 locations nationwide, at your service. Right where you want them.

If you've ever bought computers "direct," we want you to know one important thing.

IBM PC Direct

We're putting the personal in personal computing.

This time, it can be different.

This time it's

L-R: Alice Robinson, Gregg McGhee, Jeff Herman and Beverly Whitman, Custom Build Technicians, IBM Personal Computer Company

ValuePoint Si — NEW!

- Newest entry-level member of the ValuePoint family
- Compact size: 14.2" W x 4.8" H x 16.5" D
- VESA Local Bus Video
- 3 slots and 3 bays
- Choice of IBM Keyboard (Basic†† or Enhanced)
- A great, low-cost network client
- IBM HelpWare service and support
- IBM 14V 14" SVGA NI Monitor

ValuePoint DeskTop

- Plenty of room to grow: 5 slots (includes 1 VESA Local Bus slot), 5 bays
- A super combination of speed, power, upgradability and expandability
- IBM 14V 14" SVGA NI Monitor

ValuePoint Mini-Tower

- Convenient, compact Mini-Tower processor case measures 9.5" W x 16.8" H x 16.9" D
- Enormous room for growth: 8 slots (includes 1 VESA Local Bus slot), 6 bays
- Perfect format for high-powered computing (CAD/CAM, graphics, multimedia, etc.) or as a low-cost network server
- IBM 15V 15" SVGA FS NI Monitor

Dozens of popular software applications are available through Soft Select™. Call us for a complete listing.

IBM PC Direct

We're putting the personal in personal computing.

IBM

If you don't see it here, call us. We'll custom build a system just for you.

It's a personal commitment from Alice, Gregg, Jeff, Beverly and their associates at the IBM Personal Computer Company. Thousands of IBM people – many working around the clock – to keep you personally delighted with everything we do for you.

It starts – but doesn't end – with our hot-selling IBM ValuePoint™ PCs. Take a closer look at the systems shown here. Super PCs. Super prices. But if you don't see the system you want, call us. We'll build your PCs to your specifications – and your budget. We can even preinstall selected software.

Remember. ValuePoint is backed by IBM HelpWare®, including our 30-day moneyback guarantee. No qualms. No quibbles. No questions asked.[1] And for one year with free around-the-clock telephone assistance and fast onsite service (even in the most remote locations!) from more than 10,000 IBM service representatives in over 1,600 locations nationwide.[2]

Call us today. And discover how we're putting the personal in personal computing.

intel inside

All ValuePoint DeskTop and Mini-Tower systems listed below feature:[††]

- 486 processors
- SVGA VESA Local Bus Video
- Upgradability via Intel OverDrive™ technology all the way up to Pentium™ [3]
- 101-key IBM Enhanced Keyboard and IBM Mouse
- Zero Insertion Force (ZIF) socket for fast, easy processor upgrades
- A 32-bit VESA Local Bus slot for local bus speed on SCSI drives and other peripherals
- IBM HelpWare

ValuePoint Si	425SX/Si	425SX/Si	433DX/Si	466DX2/Si
Processor	i486SX/25MHz	i486SX/25MHz	486DX/33MHz[1]	i486DX2/66MHz
Hard Drive/Memory	120MB/4MB	212MB/4MB	120MB/4MB	212MB/4MB
Drive(s)	3.5"	3.5" & CD-ROM	3.5"	3.5"
Monitor	IBM 14V 14" SVGA NI	IBM 14V 14" SVGA NI	IBM 14V 14" SVGA NI	IBM 14V 14" SVGA NI
Operating System	IBM DOS & WINDOWS™	IBM DOS & WINDOWS	IBM DOS & WINDOWS	IBM DOS & WINDOWS
Price* / IBM Credit Lease**	**$1,469** / $53 per month	**$1,893** / $68 per month	**$1,819** / $66 per month	**$2,328** / $84 per month
ValuePoint DeskTop	**425SX/D**	**433DX/D**	**450DX2/D**	**466DX2/D**
Processor	i486SX/25MHz	486DX/33MHz[1]	i486DX2/50MHz	i486DX2/66MHz
Hard Drive/Memory	212MB/4MB	212MB/4MB	212MB/4MB	245MB/4MB
Drive(s)	3.5"	3.5"	3.5" & CD-ROM	3.5"
Monitor	IBM 14V 14" SVGA NI	IBM 14V 14" SVGA NI	IBM 14V 14" SVGA NI	IBM 14V 14"SVGA NI
Operating System	IBM DOS & WINDOWS	IBM DOS & WINDOWS	IBM DOS & WINDOWS	IBM DOS & WINDOWS
Price* / IBM Credit Lease**	**$1,689** / $61 per month	**$2,039** / $73 per month	**$2,504** / $90 per month	**$2,609** / $94 per month
ValuePoint Mini-Tower	**433DX/T**	**433DX/T**	**466DX2/T**	**466DX2/T**
Processor	486DX/33MHz[1]	486DX/33MHz[1]	i486DX2/66MHz	i486DX2/66MHz
Hard Drive/Memory	245MB/4MB	340MB/4MB	340MB/4MB	420MB/4MB
Drive(s)	3.5"	3.5" & CD-ROM	3.5"	3.5"
Monitor	IBM 14V 14" SVGA NI	IBM 14V 14" SVGA NI	IBM 14V 14" SVGA NI	IBM 15V 15" SVGA FS NI
Operating System	IBM DOS & WINDOWS	IBM DOS & WINDOWS	IBM DOS & WINDOWS	IBM DOS & WINDOWS
Price* / IBM Credit Lease**	**$2,259** / $81 per month	**$2,634** / $95 per month	**$2,779** / $100 per month	**$3,039** / $109 per month

[1] Some 486DX/33MHz processors may be manufactured by IBM. [††] ValuePoint Si systems do not include all features listed above chart. Please refer to product details listed at left, or call for more information. ValuePoint Si prices listed reflect IBM Basic Keyboard only. IBM Enhanced Keyboard available at additional cost.

Call 1 800 IBM-2YOU

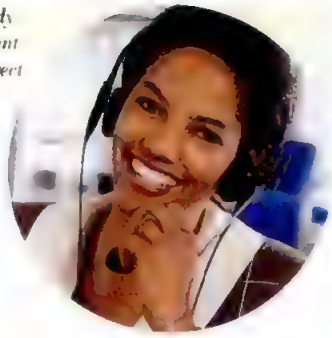
refer to: AJV

1 800 426-2968
8am-midnight M-F, EST
8am-7pm Sat., EST

Purchase order is available for qualifying customers.

IBM®

Angela Hardy
PC Consultant
IBM PC Direct



It's as simple as calling Angela Hardy, or any one of our other PC consultants. ValuePoint PCs, ThinkPad® notebooks, peripherals, printers, monitors, add-ons, the most popular software and more (IBM and non-IBM) are all yours – at prices you'll find personally pleasing – when you call 1 800 IBM-2YOU. You'll speak to a PC consultant who'll either answer any question you have, or get you in touch fast with an expert who can. If you don't see it here, it's in our free catalog. And if it's not in the catalog, we can probably get it for you anyway. Either way...call!

This time you can have it all.

Super prices on popular software!

IBM PC Direct has the popular software you want, at prices you'll love. Remember, if you don't see it here, or in our catalogs, call us. Chances are we can get it for you fast!

WinFax™ Pro (MM13632) $79

STACKER® (MM29205) $95

Quicken™ for Windows 2.0 (MM45870) $45

WordPerfect® for Windows 5.2
3.5" (MM77919) $289
5.25" (MM80915) $305

Boost your processing performance.

Here's a super way to boost system performance without buying a new system. Our 256KB L2 Write Back Cache Memory Kit, Video Memory Upgrade Kits and Intel OverDrive Processor make it easy to upgrade your ValuePoint system. And we now offer L2 Cache Memory Kits for the ValuePoint Si, too!

ValuePoint Options

256KB L2 Write Back Cache Memory Kit
(60G1626) $249

256KB L2 Write Thru Cache Memory Kit
(60G1625) $229

128KB L2 Write Thru Cache Memory Kit
(60G1624) $119

1MB Video Memory Upgrade Kit (60G1623) $89

Intel OverDrive Processor 486DX25
(MM09983) $389

ValuePoint Si Options

New! 128KB L2 Cache Memory Kit (73G3128) . . . $90

New! 256KB L2 Cache Memory Kit (73G3129)
(requires part 73G3128) $60

New! 512KB Video Memory Upgrade Kit
(73G3127) $42

Save space inside your multimedia PC!

The IBM Windsurfer™ Communications Adapter is the complete small business/home office ISA solution! It's a data/fax modem, a telephone answering machine, a CD-quality sound system and MIDI synthesizer...all in one! Included are a V.32 Data Modem, 9600bps Fax/Modem, IBM PhoneFX™ for Windows, Mwave™ MIDI synthesizer with MIDI port, Trio DataFAX LITE for Windows...and more.

Mwave Windsurfer Communications Adapter
(82G7259) $349

Improve your communications and connectivity!

Whether you need to communicate with outside customers, satellite offices or the person next door, we offer a range of options for keeping you connected.

Boca Research™ 14.4/14.4 Data/Fax Modem, including FaxWorks™ (MM28202) $175

10Base-T ISA Ethernet® Adapter (60G0605) $91

10Base-2 ISA Ethernet Adapter (60G0615) $100

IBM Token-Ring 16/4 AT Bus Adapter
(25F7367) $490

Give your PC gigantic storage capacity!

There are more options than ever for upgrading your current system. Replace your hard drive to keep up with tomorrow's demands, or add an additional diskette drive for increased flexibility...the choice is yours!

IBM 5.25" Internal, 1.2MB diskette drive
(32G3947) $99

340MB AT IDE Hard Drive (32G4195) $539

527MB AT IDE Hard Drive (32G4196) $999

The easy, affordable way to go to a speedy CD-ROM.

The ISA Internal CD-ROM has a fast 300KB/SEC maximum data transfer rate – double the speed of most CD-ROM drives! You can load your operating system and applications software from a typical 600MB CD-ROM disk. You save precious hard drive space and load onto your ISA system faster. It's priced to move fast too!

IBM ISA Internal CD-ROM Drive (32G2961) . . . $315

FREE!

The IBM PC Direct™ Source Book. ValuePoint, ThinkPad, peripherals, add-ons, popular software...it's all here and it's all yours for the asking. Call 1 800 IBM-2YOU today!

*IBM prices only. The offerings, prices and products are subject to change or withdrawal without prior notice. Products you acquire may not be counted under any existing Volume Purchase Agreement. The same offerings and products may be available through IBM Authorized Remarketers. Remarketer prices may vary. Shipping and handling charges are extra. **IBM Credit Lease prices are quoted for 36-month terms. Lease rates quoted are good through 1/1/94 after which time rates are subject to change without notice. Lease available to qualified commercial customers only. 1. Copies of warranty and 30-day moneyback guarantee information available through IBM and IBM Authorized Dealers. Please call 1 800 426-2968 for details regarding IBM's moneyback guarantee and limited warranty. 2. At no additional charge during warranty period. Onsite service available Monday-Friday 8am-5pm in your time zone. APPLIES TO IBM DIRECT SALES ONLY. 3. Upgradable with Intel's future OverDrive processor based on Pentium technology. IBM, HelpCenter, HelpWare, and ThinkPad are registered trademarks and ValuePoint, Mwave, PhoneFX, Soft Select and WindSurfer are trademarks of International Business Machines Corporation. All other brands or product names are registered trademarks, trademarks or service marks of their respective holders. PC Direct is a trademark of Ziff Communications Company and is used by IBM under license. ©1993 International Business Machines Corporation.

Call 1 800 IBM-2YOU
refer to: AJV
1 800 426-2968
8am-midnight M-F, EST
8am-7pm Sat., EST
Purchase order is available for qualifying customers.

IBM PC Direct

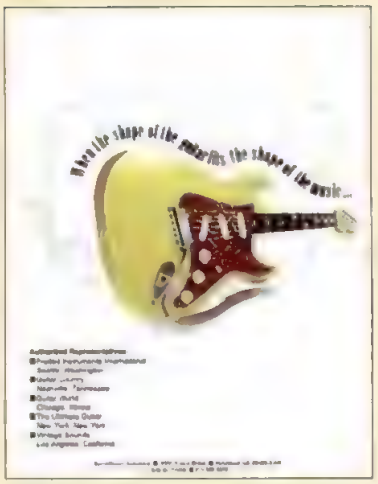
We're putting the personal in personal computing.

How We Tested: Illustration Software

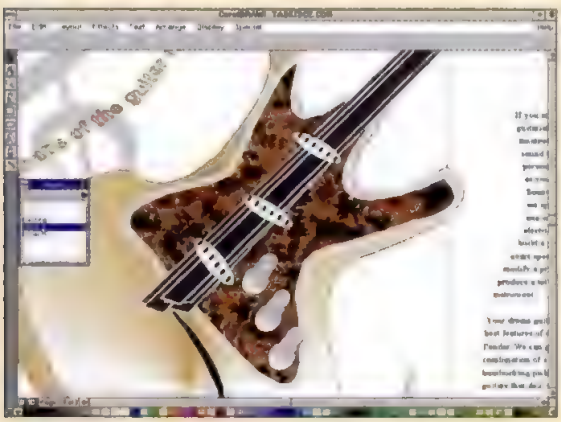
In order to evaluate these packages, each reviewer performed a series of sophisticated illustration tasks, five of which went into the creation of a two-page mock ad for the fictional company SoundBoard Acoustics. We also tested each package for its technical drawing capabilities as well as its output and the color quality of that output.

The first step called for reviewers to duplicate a photograph of a Fender Stratocaster guitar. Recreating the sunburst pick guard of the guitar required reviewers to test the fill tools of their packages, making use of any textures, gradients, or bitmap fills available, while also testing packages' ability to clip fills to the paths of the vector drawings. Reviewers used the curve-drawing toolset to design and edit the nodes comprising the Bezier and spline curves used for the irregular shape of the guitar body.

The next task called for reviewers to create the headline treatment that would eventually be incorporated into the ad layout. To test the packages' ability to set text along an irregular path, we placed the headline along one side of the guitar. Text-handling capabilities such as the ability to adjust the kerning, letterspacing, and wordspacing, as well as to skew or slant the text for better alignment, were put to the test for creating the headline. We then asked reviewers to import and autotrace a TIFF image of sheet music. The horizontal lines that cross both vertical lines and curved lines and the varying thickness of the flags of the musical notes in this image served as a good test for a package's autotracing capabilities.



Our full-color advertisement includes autotracing, DTP functions, and even an artistic illustration. This example was created in Canvas.



Our creative illustration tested the depth and flexibility of a package's tools and special effects. We used CorelDRAW's fractal textures to create the fill on the guitar pick guard.

The technical illustration stressed precision drawing tools. Designer's ability to work with scale and exact dimensions was useful in replicating the guitar pickup.

To evaluate a package's paragraph-handling capabilities, reviewers imported and formatted several text blocks of varying lengths. They flowed text from one column to another, chose typefaces and other font attributes, and used all paragraph controls available to them, including tabs, indents, spacing, and leading. Reviewers then used the packages' page-layout tools to integrate each of these elements, along with an imported .EPS file, into a two-page spread.

The next two tasks evaluated the packages' technical illustration capabilities. The first called for reviewers to create a schematic drawing of a single-coil guitar pickup. We asked reviewers to use whatever technical illustration tools were available to them, including automatic dimension lines, and the ability to snap to tangent points, create arrays, convert text to curves, and, if possible, connect with a database to designate object information or notations. We exported the files to .DXF format to evaluate how layers were handled and how well the packages converted draw primitives into polylines.

The second half of this task required reviewers to test each product's ability to create another type of technical drawing: an organization chart. Specifically, we looked at the selection of hatch patterns and line styles, as well as the ability to clone master objects and create any special charting effects. Here, tools such as smart connectors came in handy. Also important were good alignment tools.

Finally, to gauge each package's output and color quality, we printed the images on an HP LaserJet III in both PCL and PostScript modes, and on a Tektronix Phaser IIsdx dye-sublimation color PostScript printer. We exported the files in CGM, EPS, and .WMF formats, opened these files in a variety of standard graphics applications, and analyzed the results for print speed, accuracy, color fidelity, and proper lines and fills. We also generated four-color–separation files to evaluate the programs' built-in color-separation facilities.—*Jeff Mace*

Although Illustrator doesn't have a true gradient-fill function, it lets you create highly sophisticated color fills by applying a mask to a color blend.

shortcut keys, but it lacks some of the newer usability features found in other packages, such as pop-up menus that appear with a click of the right mouse button, floating palettes, and macro capabilities. A large and sometimes intimidating toolbar includes some cryptically named selection tools; if you pick the wrong one you'll find yourself stretching a line segment out of an object instead of moving the object itself. Many dialog boxes could use sliders or scroll buttons, and there's only one level of Undo/Redo. Furthermore, Illustrator doesn't support OLE, DDE, or pressure-sensitive tablets and removable-cartridge disk drives.

Consequently, some tasks are more complicated than they should be. In many programs, you can stretch an object by dragging a handle. In Illustrator, however, you have to choose the correct selection tool, click the object, select a Scale tool, click again to designate an origin point, and then drag the object. Other procedures are downright counterintuitive: Using a mask to hide part of an object involves placing it behind the object rather than in front.

SUITABILITY TO TASK

Adobe Illustrator

	POWER	EASE
Artistic illustration	Good	Fair
Technical illustration	Good	Fair
Color publishing	Excellent	Good

CROSSING BARRIERS

Once you grow accustomed to these idiosyncrasies, however, Illustrator becomes a powerful tool for producing creative illustrations. You can edit up to 20 drawing files at once either as wireframes or in 24-bit color. Illustrator places no limits on the number of points and objects in a drawing, offers excellent compatibility with Macintosh-based service bureaus, and runs well on a fast 386. It also provides a grab bag of useful support features, such as on-screen color calibration and a simple two-dimensional charting tool.

Illustrator's drawing tools have the depth and flexibility to provide several ways of performing the same task. In our testing, for example, accurately drawing the electric guitar in oblique perspective would have been a challenge. But it's not nearly as hard to sketch a simple outline without perspective and then use Illustrator's Shear tool to add exact amounts of horizontal and vertical distortion. An even easier solution is to use Illustrator's Place Template function to insert a bitmap of the original photograph behind the drawing surface and then sketch over it as if you were using a light box. This flexibility is one of the program's greatest assets.

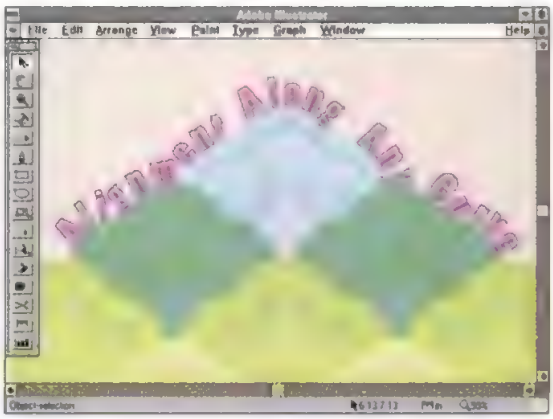
Illustrator's excellent Blend tool places no restrictions on the number of intermediate objects it creates, but the program lacks other built-in effects, such as 3-D extrusions and a true multipoint perspective tool. With a little work, you can create these effects manually, but that's no substitute for a robust set of automatic tools.

Object layering is another handicap: There are no named layers and, although they can be grouped, no two objects can occupy the same layer. What's more frustrating is that you can only place objects in the foremost or rearmost layers, a constraint that makes it difficult to create complex compositions with overlapping objects.

LIVING COLOR

Illustrator's color handling, however, is extremely powerful. Though the package doesn't offer a floating palette, you can always set a color by double-clicking the right mouse button. Illustrator supports CMYK, HSB, HSL, and RGB color models; incorporates the entire Focoltone, Pantone, Toyo, and Trumatch spot color systems; and lets you create your own palettes of custom colors. There's no point-and-click gradient-fill feature, but you can create sophisticated custom gradients by masking multicolor blends.

One of Illustrator's greatest strengths is its text- and page-layout capabilities. You can align text to an arbitrary curve, pour it into any shape, and even snake columns of text through multiple objects—all without losing the ability to edit the text on the screen. Illustrator also provides DTP-like control over parameters such as leading, auto-kerning, and word and letter spacing. But the package doesn't support features such as spell-checking, hyphenation, or the ability to define custom page sizes, text styles, or page colors. More disappointing is Illustrator's lack of support for TrueType fonts.



Illustrator's broad selection of text-manipulation features lets you wrap words around or inside any object, then edit the text on-screen.

Users involved in technical drawings will be let down by Illustrator's lack of automatic tools for operations such as bisection, dimension-labeling, or object intersection. They'll also miss named layers, database functions, and a true perspective tool. Nonetheless, any draftsperson who understands the mechanics of perspective drawing will

Upcoming in Illustration

by Gayle C. Ehrenman

As the feature wars heat up in the illustration software arena, two popular favorites prepare to jump into the fray with upgraded toolsets and significantly revamped interfaces. Professional Draw, Version 2.0, from Gold Disk and Aldus FreeHand, Version 4.0, both of which were in beta at the time of this roundup, should give the category leaders a tough fight. Pricing information was not available as we went to press, but both products should be available early this year.

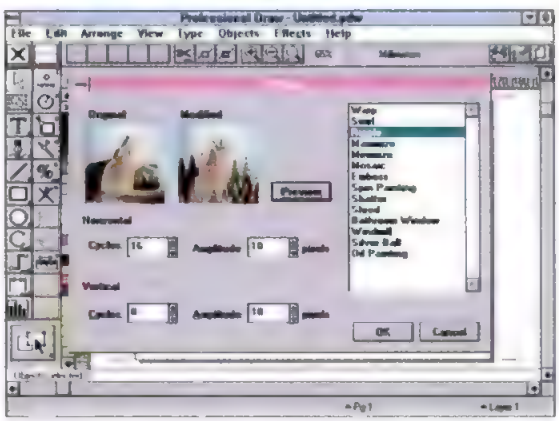
Both packages have taken the productivity-through-simplicity approach to interface design. FreeHand, which always had floating palettes, has now added roll-up menus as well as an Inspector palette that replaces over 30 of Version 3.1's modal dialog boxes. This multipurpose palette, which takes the place of the confusing Info box, provides one-stop shopping for creating and modifying objects, text, lines and fills, pages, and documents.

Professional Draw has taken a slightly different approach to interface design. Instead of giving users a fixed set of floating palettes, this package lets users create their own floating toolbars. Also new here is an improved floating Layer Manager that makes it easier to take advantage of the program's sophisticated layer-handling capabilities, which now allow you to edit across layers.

SOMETHING OLD, SOMETHING NEW

The retooling doesn't stop with interface enhancements, though. The functionality of both programs has been significantly enhanced via upgrades to existing capabilities and the addition of important new features.

In FreeHand, the biggest addition is a set of sophisticated text-control and DTP features. Whereas previously the text handling was minimal, now it's positively robust. You no longer need to type text directly into FreeHand; you can now import it in ASCII or RTF formats. Once you get your text into the package, you can take advantage of the new type-speccing and paragraph controls, which include the ability to perform pair and range kerning, set leading and line lengths, drag and drop tabs, and apply hanging punctuation. As for DTP functions, this version of the package adds the ability to work with pages of various sizes in a single publication, as well as to create columns, rows, linked text blocks, gutters, and margins easily. FreeHand also boasts a unique new feature, Automatic Copyfitting, that will reduce or enlarge text by a specified percentage in order to fill a column.



Professional Draw 2.0 offers a host of new features, including a revamped interface and some well-integrated photo-retouching tools.

Automation has also come to FreeHand's color controls. Now, you mix colors in the color mixer, then add them to the color list palette by dragging and dropping. To change the color of an object or text, you simply drag and drop from the color list to your illustration. The new version also supports a variety of color-matching systems, including DIC, Focoltone, Pantone, and Toyo.

MORE POWER

Professional Draw's strengths have always been its precision drawing tools, and in this version they're even more robust. In addition to the previous automatic perspective and isometric drawing tools, you can now choose different types of projection lines for different types of drawings, set up to three vanishing points anywhere on the screen, and use projection lines that automatically converge on these points.

For technical illustrators, Professional Draw adds the ability to create dimension lines that measure distance and angle automatically, and to set real-world units of measurement for scale drawings. The 3-D extrusions have also been improved to allow you to apply a point light source, and then to rotate your extrusion in 3-D space. For creative illustrators, the new attractive features include additional gradient-fill types, newly added fractal texture fills, stroked lines, and improved color- and text-handling controls.

For users seeking an all-in-one graphics solution, Professional Draw has added a graphing module, a Presentation Editor, and an image-editing module. All of these modules are flexible and robust, work just like the standard drawing tools, and are well-integrated into the rest of the program.

With improvements and innovations such as these, the already competitive illustration software market should become even more interesting. □

Quantity Requires Quality.

Data Storage Media

DATA CARTRIDGES
CD-RECORDABLE
FLOPPY DISKS

Information isn't just data, it's your intellectual property. Which is why the more you value your work, the more you'll appreciate TDK data storage media.

When creating back-up or distributing large quantities of data, you can rely on TDK Data Cartridges for dependable operation and maximum data protection. For your multimedia, software development or archiving applications, TDK Recordable Compact Discs (CD-R's) provide optimum integrity and system compatibility. And for your everyday file needs, TDK Floppy Disks guarantee an unequaled level of reliability.

Intellectual property is an idea we take very seriously. So when you think quantity and quality, think TDK—to save, retrieve and distribute your property. For more information, call 1-800-835-8273, x203.

Before you write. Think TDK.

TDK

CIRCLE 112 ON READER SERVICE CARD

FACT FILE

Adobe Illustrator for Windows, Version 4.01

Adobe Systems Inc., 1585 Charleston Road, Mountain View, CA 94039; 800-833-6687; fax, 415-961-3769

List price: $695

Requires: 386-based PC or better, 4MB RAM (8MB recommended), 12MB hard disk space, VGA display or better (24-bit VGA display recommended), DOS 3.3 or later (5.0 recommended), Microsoft Windows 3.x, mouse

In short: Long considered one of the most powerful and flexible packages on the market, Illustrator has gone nearly three years without a major upgrade. The program is still powerful by today's standards, but it's starting to fall behind the competition in areas such as ease of use, special effects, and integration into the Windows environment

452 ON READER SERVICE CARD

be able to use the standard drawing and measurement tools to perform precision line drawings and render accurate 3-D perspective.

The package excels in its bulletproof color output. The Separator utility offers over 100 PostScript Printer Definition (PPD) files that define device-specific information such as dot gains, UCR/GCR values, and screen angles. If you need nonstandard settings, you can edit the PPD files in any text editor, which isn't a task for the novice; in most cases, however, the defaults work fine. We had no problem getting attractive output on our tests.

This version of Illustrator is powerful enough to meet the needs of professional artists, and is especially strong at text manipulation and color output. Nonetheless, the program takes some time to master, and its user interface is beginning to show its age. While Illustrator's toolset has depth and flexibility, the product lacks the ease-of-use features available in the latest crop of Windows drawing packages.

Illustrator is still a good product, but it's just about ready for an overhaul. Version 5.0 has made its debut on the Macintosh, so look for a new PC-based Illustrator before too long. This is one package that is dure to be around for a long time.

Deneba Software

Canvas for Windows, Version 3.5

BY LUISA SIMONE

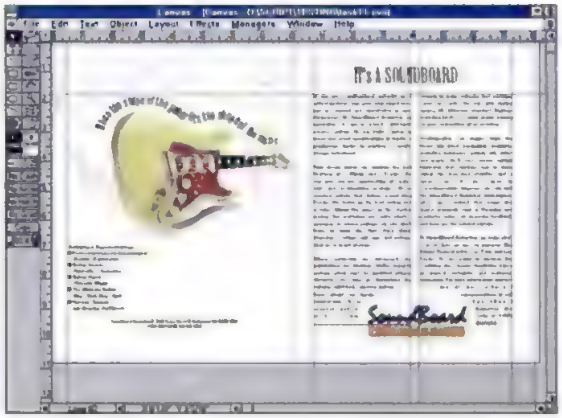
By providing enough power for most illustration tasks at a reasonable price, Deneba Software's Canvas for Windows, Version 3.5, may have hit upon a recipe for success. The two basic ingredients in this $399 drawing program are robust drawing tools and intelligent technical illustration functions. The PC Magazine Labs test suite exercised both types of drawings by including an artistic illustration—in the form of an electric guitar—and a mechanical diagram of an electric guitar's single-coil pickup.

The guitar began as a simple outline created with Canvas's basic drawing tools, which include lines, rectangles, and Bezier curves. By embellishing the guitar, we were able to take advantage of the program's more advanced features. For example, we drew all the strings simultaneously and equidistantly using the Parallel Line tool. Canvas supplies an entire palette of object-level drawing tools, so creating cubes, concentric circles, or multisided polygons is as easy as clicking on a tool and dragging the mouse.

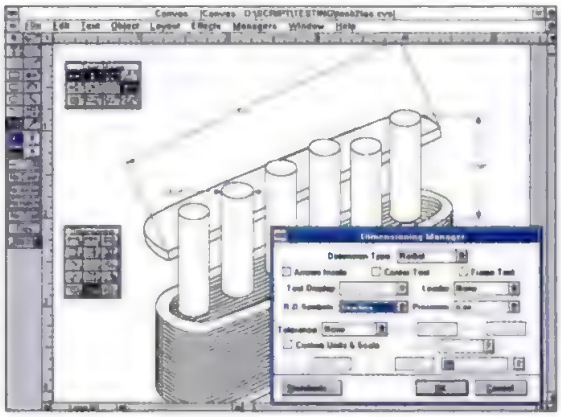
We were particularly impressed with the synergy between Canvas's drawing tools and the built-in painting functions. Unlike most illustration programs that can only import bitmapped images, Canvas lets you paint full-color bitmaps within your drawing. The painting tools are rudimentary, but they enabled us to create the marbled surface of the pick guard on the guitar. In the same way, the special effects tools, which include extrusion and perspective, let us quickly create the knobs and make parts of the guitar recede into the distance.

The guitar illustration highlights Canvas's artistic effects, but it is the black-and-white drawing of a single-coil pickup that showcases the program's technical drawing functions. Canvas's Smart Mouse, dimension lines, smart connectors, and macro objects prove that intelligence is ultimately more powerful than brute force. For example, instead of giving you a few arbitrary constraints, the Smart Mouse lets you configure your own constraint options and use them in combination. Therefore, you can draw a line that simultaneously bisects an object's side while maintaining an angle of 33 degrees.

Other signs of intelligence include macro objects that function like clones and connector lines that are dynamically redrawn when you move the objects to which they are attached. Arch-

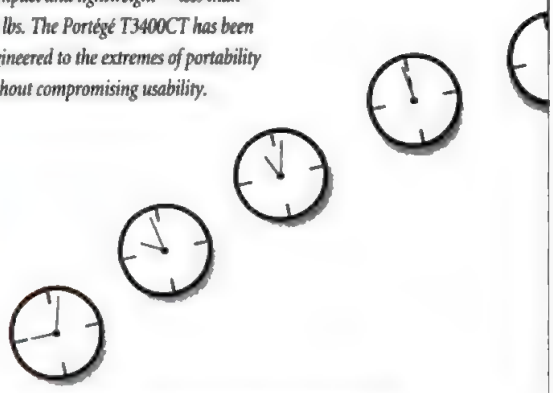


The simple text layout shown in Canvas had to be created by manually speccing a dingbat font for the first character and then inserting tabs.



Among Canvas's technical drawing tools is the Smart Mouse. That window is shown here with four different constraints active simultaneously.

Compact and lightweight —less than 4.4 lbs. The Portégé T3400CT has been engineered to the extremes of portability without compromising usability.



FINALLY, COMPUTER SCIENCE EMBRACES THE LAWS OF MOTION.

Toshiba continues to drive PCMCIA technology: A 2.01 compliant Type II slot expands your options for storage, fax/modems, networking, and the future.

The new AccuPoint™ isometric pointing device works in conjunction with click and drag buttons located comfortably beneath the thumbs.

INTRODUCING THE NEW ULTRAPORTABLE PORTÉGÉ.

Toshiba engineers haven't just redesigned the portable computer, they've reinvented it: The Portégé™ T3400 Series. Never before has a computer so perfectly balanced mass and speed.

PORTÉGÉ

Now you can travel with a system smaller than a notebook, yet graced with the feel of a full-size system. Portégé is driven by the full force of an i486™ SX/33 processor, and shines with Toshiba's renowned color active matrix or high-contrast backlit monochrome displays. Toshiba designers have even created the optional Port Replicator for simple, single-point connection to your desktop environment. See how far Toshiba has taken every aspect of portable computing. And think where it can take you.

Call 1-800-457-7777 for the dealer nearest you.

intel inside

THE SHAPE OF THINGS TO GO.℠

Toshiba discovers the secret to longer life: The ultra-lightweight Li-Ion battery, with up to 8 hours of battery life, is the ultimate in power-per-ounce.

T3400CT
- 7.8" color TFT-LCD active matrix display—256 color SVGA
- 7.9" x 9.9" x 1.8"
- 4.4 lbs.

T3400
- 8.4" STN monochrome display
- 7.9" x 9.9" x 1.7"
- 4.1 lbs.

Both Models
- 33MHz SL Enhanced i486™SX
- 120MB HD
- 4MB RAM (expandable to 20MB)
- Lithium-Ion battery
- Type II (5mm) PCMCIA 2.01 slot
- AccuPoint™ integrated pointing device
- Integrated BitBLT graphics accelerator
- VL-local bus video
- Ports: serial, parallel, FDD, Port replicator, and VGA adapter
- Windows™ 3.1, DOS™ 6.0, CommWorks™ for Windows

3 YEAR LIMITED WARRANTY

In Touch with Tomorrow

TOSHIBA

© 1993 Toshiba America Information Systems, Inc. All products indicated by trademark symbols are trademarked and/or registered by their respective companies

CIRCLE 379 ON READER SERVICE CARD

Efficient PostScript Printing

by Lori Grunin

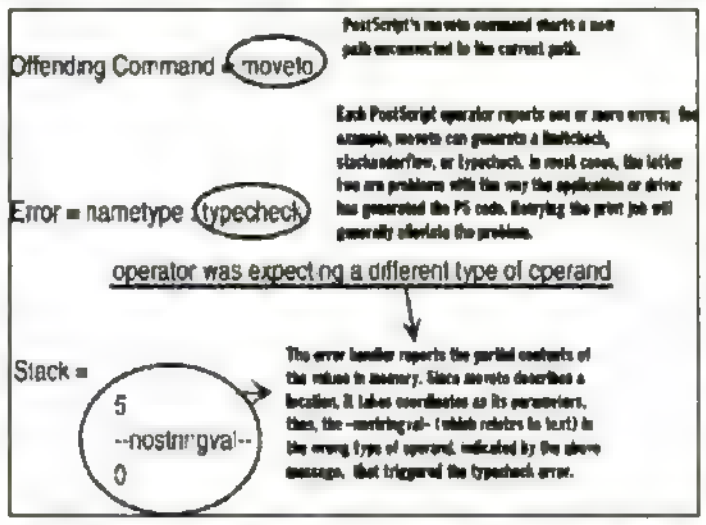
Thanks to modern technology, you wear more hats than you used to. You're no longer just an illustrator—you're also a typographer, layout artist, and prepress operator. And if you want to get output from a PostScript device quickly and consistently, you're a bit of a programmer as well. While you don't have to write any PostScript code, understanding how the language works and where its limitations lie can help you greatly improve your printer's performance and diagnose printing problems.

You won't be able to track down the errors generated by an illustration unless you first download the PostScript Error Handler, a PostScript program that translates and prints error information. Under Windows, you download the handler by first selecting your printer in the Control Panel. Then, check the Print PostScript Error Information box under Setup/Options/Advanced. With an error handler loaded, the device generally prints up to the point at which the error occurs, making it easy to diagnose the problem object.

THE NEXT LEVEL

Like any programming language, PostScript allocates memory to hold commands, data, transformations, and other processing information. Most user-solvable printing problems stem from insufficient memory in the printer. Knowing what types of operations require memory and how to circumvent them can be invaluable. The memory errors generated most often are *limitchecks*. If you have a PostScript Level 1 printer (check your printer documentation if you are not sure whether you have level 1 or 2), chances are you experience these more than you need. Why? Because Level 1 can only handle a set maximum of information, such as 1,500 points per path. Level 2 interpreters, on the other hand, dynamically reallocate virtual memory across operations, alleviating many of these memory problems.

If a new printer isn't in your budget, some compromises will allow you to create efficient illustrations that actually print. All of these workarounds function by replacing a memory-intensive operation with one that is less demanding.



If you've never seen a PostScript Error Handler message, you might not recognize this very typical error report.

Use blends, not gradients. PostScript has operators that fill simple paths with solid colors; these fills take no memory and require no calculation. Gradient fills, on the other hand, require that the path reside in memory while the fill is calculated and clipped to the path.

Unlike gradients, which are recalculated at print time, blends need to be rendered for the eventual output device. Adobe Illustrator is the only application that recommends the optimal number of steps in a blend for the selected device. To calculate this yourself, you first figure out the change in color of the largest percentage. For example, if the start color is 10, 18, 20, and 15 (CMYK percentages) and the end color is 50, 50, 50, 50, the largest jump is 40 percent. Multiply that number by (printer dpi/printer lpi)^2. Thus, on a 300-dpi printer with a 50-line-per-inch screen, the optimal number of steps would be 15.

Combine, don't group. Generally, the fewer objects you have, the less memory and calculation will be required. You can combine all objects that have the same attributes—for instance, all two-point green lines—to create a single path for the interpreter to calculate and store.

Create multiple filled objects. Imagine filling four non-touching circles with a basket-weave bitmap versus combining the circles and clipping a large basket-weave bitmap to the new path. Visually the results are identical, but in practice it takes less memory and fewer calculations for the PostScript interpreter to clip four simple paths to smaller bitmaps rather than clipping one extremely complex path to a larger bitmap.

Flatten curves. PostScript defines curves with the *curveto* operator and lines via the *lineto* operator. Each curveto takes three sets of coordinates, which get plugged into a cubic Bezier equation to generate algorithmically the path taken from the current point. Lineto, on the other hand, takes only the pair of coordinates that defines the end of the straight line. As a result, curves are more memory- and calculation-intensive than lines.

Use fewer points for complex paths. As previously mentioned, each node used by a curveto requires a Bezier calculation; the fewer calculations the interpreter needs to perform, the faster your illustration will print. If your path exceeds 1,500 points, it won't print at all on a Level 1 printer. If you can't reduce the number of points in the path, then try breaking the object into separate, smaller objects. □

TO WIN THE PAPER CHASE

Print

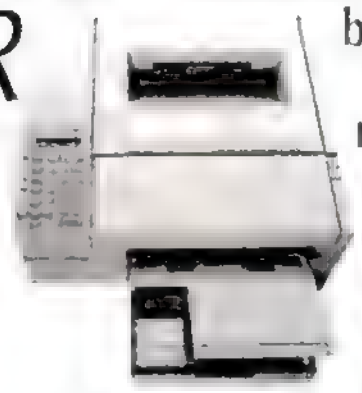
Fax

Scan

Cut and Paste

Copy

STOP CHASING PAPER



DOC•IT INCREASES YOUR PRODUCTIVITY AT WORK.

We've just brought the paper chase to a resounding and refreshing halt with the invention of DOC•IT, the revolutionary, desktop document processor that combines a multitude of talents.

With DOC•IT, Okidata has integrated faxing, printing, copying, scanning, cutting and pasting in one unit with a footprint so compact, it takes up just a corner of your desk. Incorporating graphics capability compatible with Windows™ and most major software, DOC•IT lets you create and communicate finished presentation-quality documents–complete with visuals–without having to get out of your chair.

No more standing in line. Everything sits on the corner of your desk: simple, handy, productive and private; and incredibly easy to use. If DOC•IT looks good to you on paper, come see it in action at your nearby authorized Okidata DOC•IT dealer. ***TO RECEIVE YOUR OWN ON-SCREEN DEMO DISK, OR THE NAME OF A DEALER NEAR YOU, CALL 1-800-OKI-TEAM, EXT. 266.***

CIRCLE 056 ON READER SERVICE CARD

THE SMARTEST CORNER OF YOUR DESK.

DOC•IT™ BY OKIDATA®

a Division of Oki America, Inc.

DOC•IT T.M., Okidata Reg. T.M. M.D. OKI Electric Industry Company, Ltd. Windows T.M. Microsoft Corp. "THE END OF THE PAPER CHASE" Reg. T.M. Micro Dynamics, Ltd., Silver Spring, MD.

itectural and mechanical artists will be thrilled with the dimensioning functions: With 15 types of dimension lines, you can measure everything from the radius of a circle to the length of an oblique line. And one of the hardest things to do in a technical drawing—working with scaled objects—is easy in Canvas because you can set up scaling factors for the ruler or for each dimension line.

COMPLEX PROBLEMS

As your designs become more complex, you'll discover Canvas's limitations. The program's most notable shortcoming is its inability to edit special effects dynamically. If you extrude an object and later want to modify the extrusion, for example, you must start from scratch because Canvas does not maintain the extrusion as a live, editable object. Likewise, text that is wrapped around—or even inside—an object won't automatically reflow when the layout changes.

SUITABILITY TO TASK

Canvas for Windows

	POWER	EASE
Artistic illustration	Good	Good
Technical illustration	Excellent	Excellent
Color publishing	Good	Good

The biggest source of frustration during testing was trying to wrap text along a curve *and* fill it with a gradient. Here's the conundrum: You can't fill text with a gradient unless you first convert it to curves, and you can't align text to a path once it's been converted. The solution, which involves aligning text to a path and then converting it to Beziers so you can fill it with a gradient, means that you can't go back and check the spelling or fine-tune the effect.

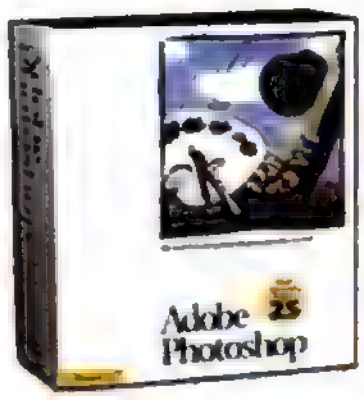
Often, the best solution was to modify our design. The layout of the sample advertisement, for example, is deliberately simplified in response to Canvas's limited text-formatting options. Although Canvas does support kerning, it lacks a number of other controls, including a discrete word-spacing option, automatic bullets, paragraph indents, automatic hyphenation, and interparagraph spacing. Furthermore, Canvas does not allow you to import text from other

▶ SUMMARY OF FEATURES CONTINUES

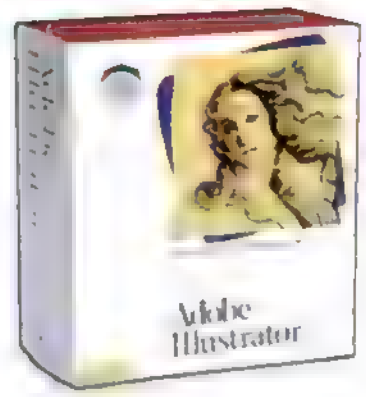
Illustration Software

Products listed in alphabetical order ■ = YES □ = NO	Adobe Illustrator for Windows, Version 4.01	Canvas for Windows, Version 3.5	CorelDRAW, Version 4.0 (PC MAGAZINE EDITORS' CHOICE)	Micrografx Designer, Version 4.0 (PC MAGAZINE EDITORS' CHOICE)
List price	$695	$399	$595	$695
General Features				
Minimum memory required	4MB	2MB	8MB	8MB
Minimum disk space required	12MB	6MB	12MB; 2MB if run from CD-ROM	10MB
Fixed/variable zoom	■■	■■	■■	■■
Revert to last saved version	□	■	■	■
OLE support	None	OLE 2.0 (client and server)	OLE 2.0 (server)	OLE 1.0 (client and server)
Support pressure-sensitive tablets	□	■	■	■
Workspace:				
Multiple open windows	■	■	□	■
Lock and hide objects/layers	■■	■■	■■	■■
Maximum number of layers	Unlimited	Unlimited	Unlimited	32,767
Color-mixing models supported	CMYK, HSB, HSL, RGB	CMY, CMYK, HSL, RGB	CYMK, HSB, RGB	CMYK, HSL, RGB
Illustration Tools				
Drawing primitives:				
Arcs	□	■	■	■
Circles	■	■	■	■
Center and diameter	■	■	■	■
Concentric/3-point	□□	■□	□□	□■
Ellipses	■	■	■	■
Axis and eccentricity	□	□	■	■
Center and two axes	□	■	□	■
Polylines/Polygons	■□	■■	■■	■■
Gradient fills	□	■	■	■
Intelligent connecting lines	□	■	■	□
Measurement systems:				
Inches/Feet and inches	■□	■■	■■	■■
Metric system	■	■ (centimeters only)	■	■
Points/Picas	■■	■■	■■	■■
Close curved paths automatically	■	■	■	■
Alignment Tools				
Align to baseline/to page	□□	■■	■■	■■
Object snaps:				
Baseline/Center	■■	■■	■■	□■
Grid/Ruler	■□	■■	■■	■■
Intersection/Perpendicular	□□	■■	■■	□□
Midpoint/Endpoint	□■	■■	■■	■■
Nearest point	■	■	■	■
Quadrant/Tangent	□□	■■	□□	□■
Object-Manipulation Tools				
Break and combine objects	■	■	■	■
Clip bitmap to object	■	■	■	■
Copy or reuse object attributes	□	■ (type styles only)	■	■
Special effects:				
Blend/Extrude	■□	■■	■■	■■
Perspective/Warp	□■	■■	■■	■■
Text Handling				
Supports Adobe Type 1 fonts	■	■	■	■
Supports TrueType fonts	□	■	■	■
Point sizes supported	0.1–1,296	1–999	0.7–2,160	2–999
Align text on baseline	■	■	■	□
Fit text to path	■	■	■	■
Wrap text around objects	■	■	■	■

THE WINDOWS DESIGN SOLUTION.



Adobe PHOTOSHOP, Adobe Illustrator & 200 FONTS.



A $2,000 value

$995.

Transform your PC into the ultimate design studio in one bold stroke. Now Adobe has gathered two of its most renowned software products plus 200 exciting fonts and priced them at an unheard of $995! This Windows™ design solution contains Adobe Photoshop™ 2.5 and Adobe Illustrator™ 4.0, both awarded PC Magazine 1993 Editors' Choice for image editing and illustration software. Also included is an extraordinary custom selection of 200 Adobe™ Type 1 typefaces. Suddenly, your design and production options are unlimited. But time is limited on this offer.* So for a reseller near you, call **1-800-833-6687, Dept. A, Ext. 1453.**

Adobe Photoshop Adobe Illustrator 1993

IF YOU CAN *dream* IT, YOU CAN *do* IT.

*Offer valid through **February 28, 1994.** Offer good in the U.S.A. and Canada only. Outside the U.S.A. and Canada, contact your local distributor. Offer not valid in combination with any other special offer and is subject to withdrawal. Adobe, the Adobe logo, Adobe Photoshop and Adobe Illustrator are trademarks of Adobe Systems Incorporated which may be registered in certain jurisdictions. Windows is a trademark of Microsoft Corporation. © 1993 Adobe Systems Incorporated. All rights reserved. Printed in the U.S.A.

CIRCLE 368 ON READER SERVICE CARD

SUMMARY OF FEATURES

ENDS

Products listed in alphabetical order ■ = YES □ = NO	Adobe Illustrator for Windows, Version 4.01	Canvas for Windows, Version 3.5	CorelDRAW, Version 4.0 (PC MAGAZINE EDITORS' CHOICE)	Micrografx Designer, Version 4.0 (PC MAGAZINE EDITORS' CHOICE)
Text Handling (continued)				
Flow text inside frames/objects	■■	■■	■■	■■
Set tabs/leaders	□□	■■	■■	■■
Kerning and leading/Tracking	■■	■■	■■	■■
Graphics Handling				
Imports/Exports:				
.BMP	■■	■■	■■	■■
.CDR (CorelDRAW)	□□	□□	■■	■□
.CGM	■■	■■	■■	■■
.DRW (Designer 3.0)	■■	□□	■□	■■
.DS4 (Designer 4.0)	□□	□□	□□	■■
.DXF	■■	■■	■■	■■
EPS:				
.AI format	■■	■■	■■	■■
With TIFF header	■■	■■	■■	□■
With .WMF header	□□	■■	■■	□■
HPGL	□□	□■	■■	■■
JPEG	□□	□□	■■	■■
.PCX	■■	■■	■■	■■
Photo CD (import only)	□	□	■	■
Pict (Macintosh)	■■	□□	■■	■■
TIFF	■■	■■	■■	■■
.WMF (Windows Metafile)	■■	■■	■■	■■
Export selected objects	■	■	■	■
Selectable export size/resolution	■■	■■	■■	□□
Trace/edit color bitmaps	■■	■■	■■	■■
Output				
Screen shows	□	■	□	■
Print options:				
Break complex curves	■	□	■	□
Center on page/Fit to page	□□	■■	■■	□■
Header and footer/Margins	□□	□□	□■	□□
Multiple images per page	□	■	■	□
Selected objects/layers	□□	■■	■■	■■
Specify curve flatness	■	■	■	□
Specify number of bands in gradient	□	■	■	□
Trim marks/Registration marks	■■	■■	■■	■■
Color-matching models supported:				
Pantone Matching System	■	■	■	■
Trumatch/Focoltone	■□	□□	■□	■■
Color-Separation Options				
GCR/UCR	□■	□□	■■	■■
Black generation	□	□	■	■
Dot-gain compensation	□	■	■	■
Ink correction	□	□	■	■
Specify C,M,Y,K frequencies/angles	■■	■■	■■	■■
Print individual plate	■	■	■	■
Print separation labels/step scales	■■	■□	■■	■■
File Management				
File preview/description	■■	■□	■■	■■
Search for file by name/by date	□□	□□	■■	■■
Support				
Technical support hours (eastern time)	9:00–8:00 M–Th, 9:00–5:00 F	9:00–8:00 M–F	8:00–8:00 M–F	24 hours M–F; 10:00–7:00 Sat.–Sun.
BBS	CIS, company-run	America Online, CIS, Genie	CIS, company-run	America Online, CIS, company-run

applications—you have to enter text manually.

BOTTOM LINE

Ultimately, the value of a drawing program is not determined by the pretty pictures it produces. Other functions, such as management tools, export filters, and printing support are equally important, and Canvas scores big points for its management tools. In fact, Canvas supplies configuration tools to help you manage the drawing tools. No fewer than 20 drawing tools can be customized using the Tools Managers. These dialog boxes allow you to do everything from specifying the number of points created by the Star tool to determining the scale of a dimension line. There's even a dialog box that allows you to include or exclude tools upon startup. So if you are trying to conserve system resources, you can load fewer tools to create your own lean-and-mean version of Canvas.

During the course of our testing, we came across several bugs when exporting files for use with other programs. Deneba, however, was quick to respond with new export tools. Right now, transferring images via the Windows Clipboard or exporting EPS and TIFF formats are your best bets. A glitchy CGM filter that mysteriously drops smart connectors and macro objects during export, and a .WMF filter that has trouble clipping gradient fills should be fixed by the time you read

FACT FILE

Canvas for Windows, Version 3.5
Deneba Software, 7400 SW 87th Ave., Miami, FL 33173; 305-596-5644; fax, 305-273-9069

List price: $399 (competitive upgrade, $99.95).
Requires: 286-based PC or better, 2MB RAM (4MB recommended), 6MB hard disk space (10MB recommended for full installation), VGA display (Super VGA or better recommended), Microsoft Windows 3.x, mouse (pressure-sensitive tablet recommended)
In short: Canvas for Windows doesn't pack the punch found in other programs, but both professionals and novices will find value in this intelligent, low-priced package. Its strong drawing and technical illustration functions will appeal to many users.

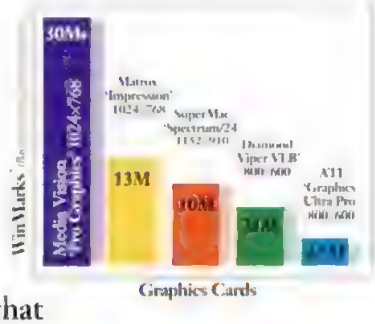
453 ON READER SERVICE CARD

GRAPHICS SO FAST, WE HAD TO GO TO A SPECIAL PLACE TO TEST IT.

Don't let the next generation of high-performance graphics cards pass you by.

Introducing Pro Graphics™ 1024. Driving a stunning 16.7 million colors at 1024 x 768 resolution, it delivers the best performance in the field. Now, that's True Color. And it's from Media Vision, the leader in innovative PC graphics. With a refresh rate of 76 Hz for a crisp flicker-free display, Pro Graphics 1024 delivers the speed you're looking for. At a price that won't blow you away.

16.7 million colors at 1024 x 768 resolution puts a new twist on performance



Why not test drive a Pro Graphics 1024 at your local computer retailer? And see what 16.7 million colors at 1024 x 768 looks like at this speed. For more information on the whole Media Vision family of Pro Graphics accelerators call **1-800-845-5870 dept. 640.**

MEDIA VISION

CIRCLE 272 ON READER SERVICE CARD

Tests performed using Ziff Davis Labs' WinBench™ V.3.11 without independent certification by Ziff. Media Vision conducted all tests based on Diamond motherboard with Intel 486DX2/66 CPU, 16MB RAM, 256K cache, 340MB IDE hard drive, MS-DOS Version 5.00. ©1993 Media Vision, Inc., 3185 Laurelview Court, Fremont, CA 94538. (510) 770 9592. Pro Graphics 1024 is a trademark of Media Vision, Inc. Any other trademarks and registered trademarks are owned by their respective holders.

this article. In fact, an upgrade (Version 3.5.1) should be available to registered users by then, as well.

PRINTING PROWESS

The final PC Labs test involved printing our images to a variety of Adobe PostScript devices as well as generating four-color separations. If you have created your artwork using the CYMK or Pantone color models, Canvas should have no trouble producing separations because it passes your values through to the output device. Trapping controls, which allow for both choking and spreading, are ideal for spot color printing methods.

The very complex image of the guitar printed to a color PostScript device (complete with lots of memory and PostScript Level 2) without a problem. Indeed, even without any calibration routines, Canvas did a fine job of matching screen-to-printer output.

Deneba has had great success on the Apple Macintosh by staking out the no-man's-land of the graphics market—the territory that lies somewhere between novice and expert users. It's a strategy that requires the right ratio of price to performance. Though Canvas is by no means the most powerful illustration package in this roundup, this capable $399 drawing program can stand its ground—the middle-ground, that is.

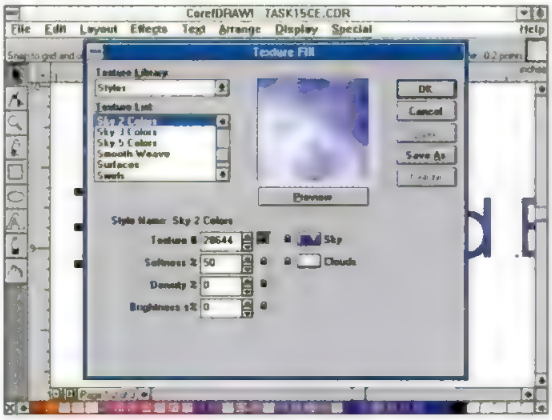
Corel Corp.

CorelDRAW, Version 4.0

BY CAROL ELLISON

Over the years, Corel Corp. has whipped its popular illustration program CorelDRAW into shape to be a heavyweight contender in the graphics market. The $595 package, which bundles separate applications for drawing, charting, tracing, and animation—to name only a few—received the Editors' Choice award in our last look at illustration packages (for more information, see "Professional Illustration: In Pursuit of Truth and Beauty," March 30, 1993). As Corel has added functionality to Version 4.0, however, the once simple interface belies a depth of features. The reams of functionality do make for some performance problems, however.

A robust professional drawing program constitutes the backbone of CorelDRAW. Roll-up menus for the various features, including PowerLines, layers, fills, and special effects, place options on-screen that you'd normally have to access via a dialog box. The menus, which can be tucked under the name ribbon when not in use, offer easy access to frequently used features. Among these features are numerous pens, node-editing tools, and color options—all of which made short work of our guitar illustration.



CorelDRAW 4.0 features several precomposed texture fills for applying to text as well as to objects. These bitmap fills are completely editable.

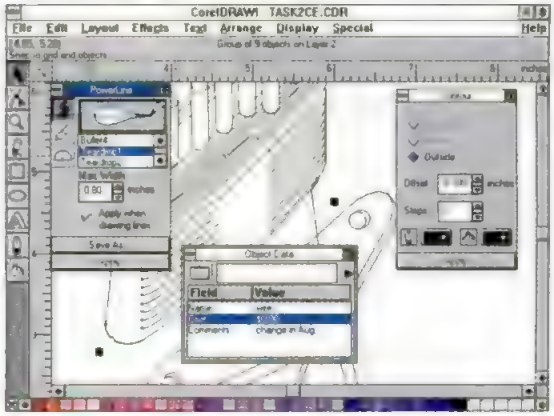
The program features 24 different PowerLines, Corel's implementation of a calligraphic pen, along with options for creating your own line types. Whereas in most packages calligraphic lines are turned into objects, CorelDRAW maintains them as rasterized lines. CorelDRAW implements the pens beautifully, capturing true calligraphic strokes and allowing you to achieve much the same effect as you would get utilizing a pressure-sensitive tablet. If you are fortunate enough to have one of those devices, CorelDRAW will support it as well.

The package gives you precise control over Bezier curves via three types of control points—smooth, symmetrical, and cusp, but it's not as simple to control spline curves as it is in Designer. CorelDRAW also offers CMYK, HSB, and RGB color models and Pantone and Trumatch color matching systems. You can mix and save custom colors and combine different types on a single palette (the program will even add colors from imported files to your working palette). Internally, CorelDRAW handles all colors as RGB, which can be transparently converted to CMYK for making separations. You also have the ability to edit in CMYK mode.

PUBLISHING POWER

CorelDRAW is no slouch when it comes to desktop publishing, either. Version 4.0 offers 15 editable document templates that allow novices to create professional-looking layouts simply by revising the dummy text and graphics. Fortunately, these features do not come at the expense of professional desktop-publishing tools.

Preset layout options for one- and two-page spreads on various paper sizes are offered in the Page Setup menu. We completed our test layout, for example, using the two-page booklet option on tabloid-size paper. However, there is no option for double-truck spreads that span separate facing pages; these must be set up manually, a tricky task made easier by the program's many snap-to and alignment options. To compensate, you can work in a preview mode of facing pages, place snap-to guidelines at the margins, and use the node edit tool to break objects, drag them across the gutter, and realign. However, this isn't the most efficient process.



Roll-up menus expand the number of tool options displayed in CorelDRAW, such as the ability to apply PowerLines for calligraphic and other special pen effects.

Preparing columns is efficient, though:

Throw your Windows wide open.

Break down the walls around your Windows.™ *OS/2® for Windows* rises above the limitations of DOS, Program Manager and File Manager, unlatching a higher level of power and performance.

Add *OS/2 for Windows* to your current Windows 3.1 setup. Now you can multitask DOS and Windows programs with more speed and reliability than ever before. Print out a WordPerfect® document while you download files from CompuServe,™ without fear of the dreaded General Protection Fault. Watch your multimedia programs really sing—and dance—with incredible audio/video synch. Right from Windows, launch into 32-bit OS/2 programs that take advantage of the full power of your PC. Or break free from the confines of Windows. The object-oriented OS/2 Workplace Shell™ interface brings "drag and drop" ease to file and print management, customization and more.

$49 *promotional price**

To order or to find out more, call **1 800 3-IBM-OS2.** In Canada, call **1 800 465-7999.** *OS/2 for Windows* is also available at local software dealers. If you use Windows, this is one window of opportunity that's wide open.

HOW OS/2 AIRS OUT YOUR WINDOWS:

Brings your PC up to speed: *exploit the 32-bit power and performance of 386SX processors—and beyond.*

Increases your productivity: *run more than one program at a time with greater reliability.*

Gives you more programs to choose from: *run DOS, Windows and OS/2 programs.*

Saves you money: *no need to buy various utilities to improve Windows performance.*

Operate at a higher level.™

IBM®

*Dealer prices may vary. Offer valid in U.S.A. only, expires 2/9/94. This ad was created by LINTAS and got to this publication on time using DOS, Windows and OS/2 programs running on OS/2. IBM and OS/2 are registered trademarks and "Operate at a higher level" and Workplace Shell are trademarks of International Business Machines Corporation. Windows is a trademark of Microsoft Corp. All other products are trademarks or registered trademarks of their respective companies. © 1993 IBM Corp.

You enter a number in an options box. CorelDRAW automatically flows the text and applies hyphenation. Fitting text around or inside objects is as easy as enclosing it in an editable envelope and using the node-edit shape tool to redraw the envelope to fit the space. Text frames can be linked, and if you need to check spelling or change a word, you can run CorelDRAW's built-in spell-checker or thesaurus. But because Corel insists on allowing you to perform kerning and leading interactively, it imposes a lot of overhead on paragraph text, making the rewrap process a painfully slow one.

CorelDRAW imported our lengthy text block competently but slowly. It also admirably handled our EPS logo import, and with the auto trace of the musical notation, imported the vector files as accurately as if they had been created in CorelDRAW's native format. Speed has never been one of CorelDRAW's strengths, and text import drastically slowed screen redraws.

Creating the headline in our layout was a breeze, thanks to CorelDRAW's ample array of effects options. All of the shaping, fill, and special effects tools for objects can be used on text. These include the ability to rotate and skew, blend shapes and colors, apply perspective and 3-D effects, create shadows, and highlight. Kerning and alignment can be done either interactively or via a dialog box regardless of what effects are applied.

FACT FILE

EDITORS' CHOICE

CorelDRAW, Version 4.0

Corel Corp., 1600 Carling Ave., Ottawa, Ontario, Canada, K1Z 8R7; 800-836-3729; fax, 613-761-9176

List price: $595 (U.S.), $695 (Canada)

Requires: 386-based PC or better (486 or better recommended), 8MB RAM, 12MB hard disk space (35MB recommended for full installation), VGA or better display, Microsoft Windows 3.1, mouse (pressure-sensitive tablet recommended)

In short: With its bundled applications for drawing, tracing, animation, and image editing, CorelDRAW provides a dynamite graphics suite for both professional and novice illustrators. It offers a multitude of useful tools for creative illustration, but not everything a technical illustrator might desire.

454 ON READER SERVICE CARD

TECHNICALLY SPEAKING

Technical illustrators won't be trading in AutoCAD for CorelDRAW. Pen options for technical illustrators include vertical, horizontal, angled, and dimension lines that can be set to scale numerically to printers' measurements. These automatically calculate the scale and offer options for where to place values, either at the center or ends of the line. Once you draw a line, however, the values must be changed manually because there is no dialog box to enter coordinates for line placement. However, CorelDRAW does offer snap-to features, and the ability to constrain angles and interactively skew and rotate objects as the program displays coordinates onscreen. An array copy would have been useful in drawing the wire coil in our rendering, though you can use the Contour feature as a workaround. This is more of a mapping tool than a rendering tool, though, so it's not the most efficient method.

SUITABILITY TO TASK

CorelDRAW

	POWER	EASE
Artistic illustration	Excellent	Excellent
Technical illustration	Good	Good
Color publishing	Excellent	Excellent

Output, however, is quite commendable. The quality of our test printouts was excellent and the program offers an abundance of color-correction and prepress tools for taking your work to color separations. Users complained loudly about bugs in the color-separation and prepress features when Version 4.0 shipped last year, but Corel's subsequent upgrade, Revision B (currently shipping with Version 4.0), appears to have fixed most of the problems. CorelDRAW also excels at 3-D effects such as extrusions, and it can easily create a 3-D background. Special fill effects, such as its fractal fills, are unmatched by other packages. Over 100 of these bitmap texture fills are included. All are editable, so you can create an infinite number of patterns.

All in all, CorelDRAW still stands at the top of the heap of professional illustration packages. Its technical illustration tools can't compete with illustration programs designed for the task, but Corel offers its robust drawing program with a variety of other graphics tools designed to make short work of most graphics needs.

Micrografx Inc.

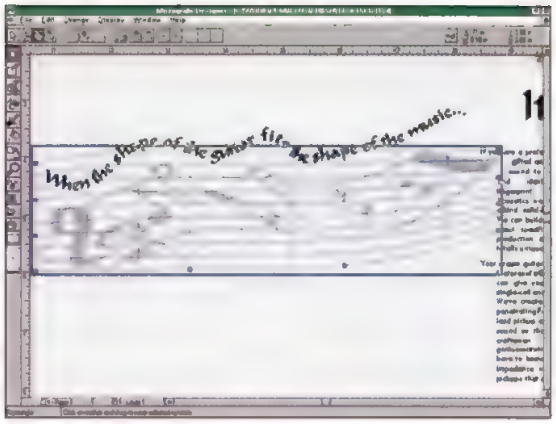
Micrografx Designer, Version 4.0

BY LORI GRUNIN

Designer, Version 4.0 ($695), is like that Victorian house you've put about six months of work into: structurally sound and much better looking than before, but you can't yet live in it comfortably. The work Micrografx has put into this long-awaited renovation clearly shows. Most notably, the company has overhauled the interface to make it more consistent with its other products. Designer does have its share of flaws, such as some disturbing bugs and functions that don't perform properly.

With the new interface, some of the useful features that were relatively buried in the previous version—such as symbol property assignments for creating parts lists—are now on the surface. Now you can assign multiple properties to a symbol. Other improvements include contextual right-click mouse menus, a context-sensitive ribbon bar, fly-out menus, and a more sophisticated customizable toolbox. Furthermore, Designer no longer uses the virtual page arrangement that nonprofessionals found so confusing (although a single page can be as large as 1,000 meters square). Multiple pages are now handled similarly to slides in a presentation graphics program, and there's even a thumbnail sorter view. Designer also supports multiple open documents. These and other changes pit Designer against CorelDRAW in terms of ease of use.

Designer's text handling is also vastly improved: The package now supports automatic text-on-a-path, flowing text around or within objects, and DTP-like block text operations. To create the three-column layout in our test illustration, for example, we simply imported our text into a block sized to the width of one column; clicking on the overflow indicator automatically created and filled



Warping an object in Designer is as easy as dragging nodes on the warp grid. The package allows you to adjust the density of the envelope for greater control over the warp.

another column with the proper dimensions, and so on. If you delete some of the blocks from the flow, the program sensibly doesn't delete the text. Instead, it pours it back into the previous container.

TWO STEPS FORWARD

Of course, there are also significant improvements in Designer's illustration tools and color handling. Designer now supports 3-D objects that exist in a 3-D space (as opposed to extruded objects that can only be manipulated in two dimensions). You create a 3-D object either with one of the predefined symbol tools, such as sphere or cube, by extruding a 2-D object or performing a 3-D sweep.

SUITABILITY TO TASK

Micrografx Designer

	POWER	EASE
Artistic illustration	Good	Good
Technical illustration	Excellent	Excellent
Color publishing	Excellent	Excellent

The 3-D sweep came in handy, for instance, when we needed to create a concave object, a procedure that could only be simulated in other packages and would take far more work to create. Applying some of the shading effects on the guitar body, screws, and other objects in our test image was much easier when we adjusted the light source placement and color than it would have been if we had played with gradient fill settings or blends.

You can also rotate an object around the *x*-, *y*-, or *z*-axis, change the perspective, and apply some basic lighting effects. If you don't like your extrusion, you can go back and change its direction or perspective; doing so, however, resets any rotation you may have applied.

In addition to all of these enhancements, Micrografx has also drastically modified the palette management and improved its already powerful array-creation capability with the Transform dialog, which lets you preview and perform multiple transforms, as well as apply groups of transforms to other objects. Designer also features a wider selection of typographical controls, including manual pair kerning, vertical justification, and forced horizontal justification.

Straight output to color PostScript-, monochrome PostScript-, and LaserJet III–compatible printers looked very good, but Designer doesn't support PPD (PostScript Printer Definition) or WPD (Windows Printer Definition) files. For color separation, Designer includes SmartSep, a generally well-designed and easy-to-use color-separation utility that gives you control over all important parameters, including traps, GCR/UCR, ink mixture, and dot gain. Unfortunately, SmartSep did not recognize our Agfa Selectset 5000 driver (with which Designer had no problem), so we went to a Linotronic 300 to generate the separations.

ONE STEP BACK

While all these enhancements are welcome—and there are tons more we haven't mentioned—Designer 4.0 is not without its share of problems. The initial shipping version has some serious bugs, including crashes when working with text on a path and random corruption of illustrations. As we went to press, Micrografx planned to release a slipstream fix for these flaws in November 1993. An early version of this patch that was available during our test period successfully cleared up the file-corruption problem. The fix is also supposed to address performance complaints that Micrografx has received from users operating 386-based systems. On a Gateway 2000 66-MHz 486 using the local-bus ATI Graphics Ultra Pro, performance was tolerable, but not particularly zippy.

Other difficulties, however, probably won't be resolved quite so quickly. Some of the new features, for instance, just don't work properly. Automatic drop caps drop from below the baseline of the first line instead of from the mean line, and the indents are incorrectly calculated. It's also possible to select objects on hidden layers, a problem that caused us to

Don't buy any Printer Sharing product until you get the fax on SmartPrint.

INSTANT INFO
Call 24 hours
1-800-373-3600
(Outside US/Canada 909-945-5600)
Ask for #1012
See why SmartPrint is your best choice for printer sharing. We'll fax you complete information including pricing, competitive comparisons and technical specifications.

SmartPrint™
Printer Sharing Network
"So Smart, it's Simple"

CIRCLE 150 ON READER SERVICE CARD

Why buy Glare/Guard® anti-glare filters?

Good for you and your company.

The best available eye protection you can get. Plus, the most reliable radiation protection. That's why more computer users worldwide trust Glare/Guard® to improve display viewability, reduce eye strain, headaches and fatigue associated with **Computer Vision Syndrome (CVS)** now affecting 10 million computer users annually.*

The only filter professionally accepted internationally. Glare/Guard is tested for Sweden's MPR II and TCO monitor radiation compliance; and accepted or certified by the prestigious Dortmund Institute and TÜV Laboratories of Germany, the French National Testing Laboratory, and the American Optometric Association for vision protection.

Double your safety. Not only are your eyes protected from the harmful effects of prolonged computer use, but because only Glare/Guard filters use tempered safety glass, breakage hazards are eliminated.

The widest range of filters for your computer. Choose from more levels of protection, in more frame styles and sizes than any other filter. Glare/Guard comes in flat, contour and custom-fit filters from 8" to 22" for color and black and white monitors. All priced to fit any budget.

Setting the standards for innovation. Glare/Guard anti-glare technology dates back to its use in the manned NASA space flights in 1962. The first to coat both sides of the filter, and to employ the use of tempered safety glass, to patent adjustable mounting systems, to develop the first wrap-around frame and a reliable radiation system. Count on Glare/Guard to set the standards for the next generation of eye protection.

Lifetime warranty.** Glare/Guard's unparalleled research, development and manufacturing ensure a lifetime of maximum eye protection for you and your employees.

Glare/Guard® by **OCLI**

Eye protection is our only business.

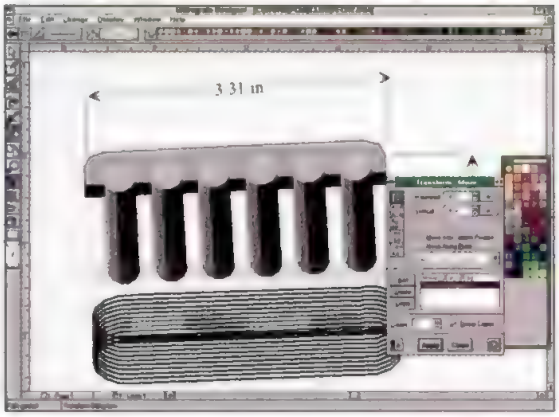
For FREE CVS information and the dealer nearest you, call:

1-800-545-6254

*Source: UC Berkeley School of Optometry, 11/91 Survey of Optometrists

**Standard™ models come with one year warranty.

CIRCLE 223 ON READER SERVICE CARD



Designer's new Transform dialog lets you preview and perform multiple transformations, as well as apply groups of transformations to other objects.

move the guitar body without realizing it. Similarly, when drawing or modifying objects numerically, we randomly received inexplicable results, such as the program resetting the object's location to 0,0 or simply ignoring our values and making up its own.

Other features don't seem to be particularly well thought out. For example, you can't add an existing color to a palette; you have to remix it from within the Add color dialog. And when you pull up the Add color dialog, it always reverts to yellow, rather than the currently selected color.

Though Designer's 3-D capabilities are a welcome enhancement, working in this mode can be particularly frustrating. There aren't any tools for aligning objects along planes (Designer doesn't even give you an isometric grid). You can't perform 3-D operations on multiple objects, which complicates making sure all the objects have the same rotation or perspective. Also, each object has to be transformed separately.

Version 4.0 of Micrografx Designer is a significant improvement over the previous version. Assuming that Micrografx has shipped its promised fix for the most serious bugs by the time you read this, you will be able to work around some of the product's rougher tool implementations. You'll still benefit from the streamlined interface and expanded toolset, allowing you to create great illustrations with a minimum of hassle. □

FACT FILE

EDITORS' CHOICE

Micrografx Designer, Version 4.0

Micrografx Inc., 1303 Arapaho, Richardson, TX 75081; 800-733-3729; fax, 214-994-6475

List price: $695

Requires: 386-based PC or better (486 or better recommended), 4MB RAM, 10MB hard disk space, VGA or better display (SVGA recommended), Microsoft Windows 3.x, mouse (pressure-sensitive tablet recommended)

In short: With a new interface and improved illustration tools, Version 4.0 of Micrografx Designer provides stiff competition for CorelDRAW for the ease-of-use crown. If not for a few bugs and the erratic nature of some of its functions, Designer would likely be recognized as the premier illustration package available

455 ON READER SERVICE CARD

New Bernoulli Insider 150 IDE
Plugs into your existing adapter.

All Bernoulli® products up to

50%OFF

Product	Old SRP	New SRP	Product	Old SRP	New SRP
150MB Insider IDE Drive and Disk	NEW	$589	Single 150MB Disk (in 5-Pack)	$159	$109
150MB Insider Drive and Disk	$1099	$599	Single 105MB Disk	$169	$99
150MB Transportable Drive and Disk	$1225	$699	Single 90MB Disk (in 5-Pack)	N/A	$99
90MB Insider Drive and Disk	$799	$499	Single 65MB Disk	$129	$59
90MB Transportable Drive and Disk	$949	$599	Single 35MB Disk	$79	$39

Iomega's just been tagged the new low price leader for removable storage. We've cut prices permanently on the most reliable storage devices around—including the high-performance MultiDisk™ 150 Drive*. See your dealer or call 1-800-695-4039.

IOMEGA®

*The Bernoulli MultiDisk 150 Drive can use 150, 105, 90, 65 and 35MB disks interchangeably. ©1993 Iomega Corp. The Iomega Logo and Bernoulli are registered trademarks and MultiDisk is a trademark of Iomega Corp.

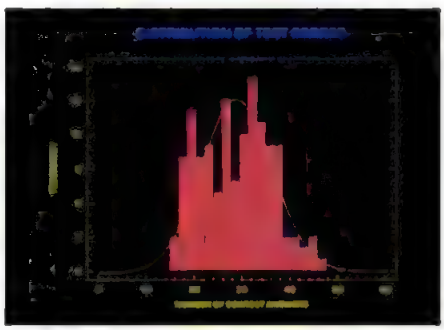
CIRCLE 378 ON READER SERVICE CARD

STATGRAPHICS *Plus*. For People Who Made It Through Statistics With Their Eyes Closed.

Whether you aced statistics in your sleep, or just plain slept, you'll find STATGRAPHICS *Plus* is a software dream come true: more than 250 menu-driven procedures, eye-popping graphics, and full support for the power and capacity of your 386/486 PC. No wonder *Software Digest* rated us number one for ease of use and learning.

How easy? This easy.

No matter how much–or how little–you know about statistics, STATGRAPHICS *Plus* does the work for you. Calculating precisely the solutions you need, from sales forecasts to assembly-line analyses to cancer research studies. And then displaying the results in stunning graphics that let you *see* the answer. With simple, point-and-click menus and a powerful graphics editor that makes generating presentation-quality results a cinch.



What you don't know, STATGRAPHICS *Plus* does.

Even if you've forgotten some–or all–of your statistics, STATGRAPHICS *Plus* remembers: Regression analysis. ANOVA. Quality control. Experimental design. Multivariate and time series procedures. Lifetime data analysis. And compatibility with your existing database, spreadsheet, and ASCII files. There's much, much more, too, including award-winning documentation, on-line help and telephone support.

But seeing is believing: call us today for more information. And witness the power of STATGRAPHICS *Plus* with your own eyes. It's the perfect tool for people who know their statistics. And for people who don't.

STATGRAPHICS® *Plus*

In Maryland, 301-984-5123.

Outside the U.S., 301-984-5412.

CIRCLE 365 ON READER SERVICE CARD

(800) 592-0050, Ext.200

Manugistics, Inc., 2115 East Jefferson St., Rockville, MD 20852. STATGRAPHICS is a registered trademark of Statistical Graphics Corporation. Evaluation © Software Digest Ratings Report, Vol. 8, No. 5 issue covering statistics programs. STATGRAPHICS *Plus* runs on 386, 386SX, and 486 computers with at least 4 MB of RAM and a graphics card. Version for 286/640K machines also available. © 1993 Manugistics, Inc. Authorized international dealers: Australia (03) 866 1766, United Kingdom (0753) 831 451, France (01) 45-27-20-61, Germany (069) 80053-0/(0212) 339099, Italy (02) 29404830, Spain (01) 341.535.0125, Sweden (0) 31 776 01 21, Netherlands (03402) 66336.

SMALL-BUSINESS ACCOUNTING

Windows of Opportunity

Small-business owners, rejoice! New Windows packages bring true ease to accounting.

by Thomas White and Kathy Yakal

As other software applications grow more complex, accounting software for small businesses—believe it or not—is going in the other direction. Thanks in large measure to a new wave of easy-to-use Windows-based offerings, accounting on the PC is actually getting simpler.

The downscaling of the economy over the last few years has produced a rapid growth in new entrepreneurial businesses, many of them very lean—and very small. Individuals starting their own companies don't have time to learn complex accounting programs and, more often than not, don't need them. What they do need is simple software that automates tasks like bill paying and invoicing and offers quick, clear financial feedback.

Accounting-software vendors, seeing

IN THIS REVIEW

BestBooks 200
CashBIZ 202
CA-Simply Accounting for Windows 202
Do-It-Yourself Accounting 203
Microsoft Profit 206
M.Y.O.B. 217
Peachtree Accounting for Windows 223
QuickBooks for Windows 227
Service Industry Accounting 230

Illustrations by Philippe Lardy

Suitability to Task: Small-Business Accounting
If you own or work for a small business, the most appealing accounting packages let you enter information and extract pertinent details quickly and easily. But accounting complexity varies with each business. The smallest and simplest companies will value an accounting package's ease of use over its power. Companies with more demanding accounting needs will require more power and data security.

We rated these nine packages by setting up the accounting books of a hypothetical small business. With the above factors in mind, we divided the duties into four broad tasks: general accounting, managing cash, managing inventory, and managing information. We evaluated each package's functionality (power) and ease of use (ease).

General accounting We evaluated the resources an accounting package provides in setting up your accounts and keeping the accounting process running smoothly. We reviewed the flexibility of the chart of accounts and the ability to define detail and summary accounts. We also noted how easily a package lets you modify one or more accounts, and we evaluated the ability to report budget amounts so that the user can gauge a company's performance against projections.

Additionally, we looked at the ability to keep a company's books on a cash or an accrual basis, the level of past detail a package will maintain on a given company, support for recurring and automatic reversing entries, the ability to track items from the General Ledger module back to the original transaction, and program security. We considered the quality of technical support, availability of additional modules to expand the package, and support for multiple departments and companies. Finally, we examined a package's level of integration with other applications. Integration features include import/export filters and support for Dynamic Data Exchange (DDE) and Object Linking and Embedding (OLE).

SUITABILITY TO TASK

Product Name	POWER	EASE
General accounting	Poor	Excellent
Managing cash	Fair	Good
Managing inventory	Good	Fair
Managing information	Excellent	Poor
Managing information	N/A	N/A

N/A—Not applicable: The product does not perform this task.

Managing cash We looked at an accounting package's capacity to track revenues and handle the inflow and outflow of money. We looked at the functions of the Accounts Payable module, including vendor setup, invoice entry, check processing, bank reconciliation, and reporting. We also looked at the functions of the Accounts Receivable module, including customer maintenance, invoicing, cash receipts, sales commissions and analysis, and reporting.

Managing inventory We evaluated an accounting package's ability to process purchase orders, and handle order entry. We looked at the package's ability to generate quotes and proposals, manage multiple warehouses, handle inventory posting and pricing, and gather accounting data at the point of sale.

Managing information We looked at an accounting package's ability to provide useful data analysis. We evaluated the quality of predefined reports designed to provide key financial statistics about a business. We also looked at each accounting program's ability to design and customize reports, as well as its ability to drill down within reports to greater and greater levels of detail. Additionally, we looked at contact- and information-management features, such as phonebooks, to-do lists, and contact-history logs.

a window of opportunity, have at long last begun to give small-business customers what they need. Emphasizing usability over absolute compliance with GAAP (Generally Accepted Accounting Principles), they've opened up their markets to those previously intimidated by the methodology and terminology of traditional accounting packages. The environment chosen for most of these efforts is Windows.

For this roundup, we looked at the nine available Windows-based small-business accounting products with retail prices of $300 or less. Unavailable in time for this roundup (but most likely available by the time you read this) were DacEasy Accounting for Windows, Microrim's In The Black, and Zebra Express. Currently available, but rendered ineligible for this roundup by its $495 price tag, is Real-World Spectrum, representing high-end accounting developer RealWorld Corp.'s first foray into the world of small-business accounting.

WHY WINDOWS?

Windows provides a particularly suitable environment for small-business accounting, which by its very nature tends to be a fragmented, not a linear, process. In one day, you might write a few checks for bills, invoice a customer or two, take a couple of phone calls from customers wanting to know if you've received a check, and run a report of your stock to see if you need to reorder anything. Since Windows programming is event-driven rather than mode-driven (that is, each task is an independent event, so you don't have to move forward and backward through complex menu structures), it simply lends itself better to this kind of work. You can get in and out of processes freely, interrupting one task to do another, ad infinitum.

Suppose, for example, you're issuing customer invoices when the UPS driver shows up with a package arriving COD. He needs to get his check immediately and be on his way. In a Windows program, it's no big deal to jump straight to your payment module, cut the check, and return to your invoicing. This represents a big savings in time and effort compared with handling the same situation in a more traditional (that is, DOS-based) accounting program, where, typically, you'd have to close your customer invoice module, move to the Accounts Payable module, log in the vendor invoice, schedule the payment, cut the check, close the A/P module, and return to customer invoicing to carry on your work.

Does this mean that there's no place in the world for DOS-based small-business

Our Contributors: STEVE GILLILAND and KATHY YAKAL are journalists who have covered the PC industry since 1983. THOMAS WHITE is a partner with Systems Advisory Services, a consulting firm. TED STEVENSON was the associate editor in charge of this story, and BEN Z. GOTTESMAN was the project leader.

accounting products? Not at all. DOS-based packages run faster than Windows applications and, at least at this stage, generally offer much more robust feature sets. But they are perhaps better suited to the needs of larger small businesses, where bookkeeping and accounting are handled by dedicated full-time staff—as opposed to an owner/manager/CFO, or that person's spouse or second cousin. For news on three leading low-cost DOS packages, see the sidebar "DOS Accounting Revisited."

WINDOWS SPECTRUM

Though these Windows products are aimed at a common target—smaller businesses and accounting nonprofessionals—they nonetheless cover a spectrum of niches. Newer products such as M-USA Business Systems' CashBIZ and Intuit's QuickBooks for Windows offer fewer accounting functions, and are thus able to provide smaller, more manageable frameworks. These products also tend to offer simplified procedures—most notably, simple deletion of corrected entries instead of the time-honored practice of reversing entries. This makes them appropriate for the smallest of organizations and businesses.

Products with longer histories, such as CA-Simply Accounting for Windows and M.Y.O.B., adhere more closely to traditional accounting procedures but have simplified interfaces and offer more help for novices. Microsoft Corp.'s new Microsoft Profit offers both usability and GAAP-compliant features.

THE RIGHT STUFF

Low-cost Windows accounting products typically include a number of up-to-date concepts and features that ease accounting work. These features are in some DOS products, but they work better in a graphical, event-driven environment. For example, Windows packages—far more than their DOS counterparts—use familiar on-screen forms. Checks look like paper checks, registers like paper registers, invoices like paper invoices. This flattens the learning curve substantially, since novices already know how to work with them.

Furthermore, these programs make

PC MAGAZINE EDITORS' CHOICE

- **Microsoft Profit**
- **Peachtree Accounting for Windows**
- **QuickBooks for Windows**

When we reviewed low-cost accounting software in May 1992, we predicted that Windows would have a big impact on the category's future development. M.Y.O.B., our Editors' Choice at that time and one of the first built-from-scratch graphical accounting applications, made good use of the event-driven nature of Windows programming to introduce some breakthrough features, most notably drill-down capabilities. M.Y.O.B. remains a fine package, for which we give it honorable mention, but its current version (3.0) has been surpassed by new blood. Version 4.0 should be available in early 1994.

Eclipsing the "older" generation are our three Editors' Choices: Microsoft Profit, Version 1.0; Peachtree Accounting for Windows, Release 2.0; and QuickBooks for Windows, Version 1.0. All exhibit innovative thinking, easy operation, and a dedication to making accounting processes transparent and financial information accessible to nonprofessional accountants.

Profit is crafted around a forms metaphor. When you need to enter a transaction, the program provides the appropriate form—be it a check, invoice, or deposit slip—to do what needs to be done. Entries are made to the appropriate ledgers and journals in the background; users don't normally need to get anywhere near debits and credits.

The program's Profit Signs component—comprising a series of management summary screens that provide at-a-glance, real-time information about many aspects of a business's finances—wins this year's award for most innovative feature. Summary report numbers on such topics as cash flow and sales are supplemented by graphs that convey essential information with the kind of impact that's hard to achieve with more traditional reports. The main caveats with Profit are its decidedly slow speed and a few rough edges.

Peachtree, though less dramatically innovative than Profit, is still beautifully thought out on its own terms and makes no compromises in power, ease of learning, or ease of use. The SmartGuides feature offers topical on-screen help, and the flowchart-style navigation system (building on the one pioneered by M.Y.O.B.) lets users see how different tasks, processes, and events are interconnected. Unlike Profit, Peachtree lets experienced users work quickly by bypassing some of the more sugar-coated aspects of the user interface intended to ease the way for beginners.

Peachtree's ten-digit account number, symptomatic of the program's depth, allows departmental groupings appropriate for medium-to-large small businesses. Multilevel password security, multiuser functionality right out of the box, and an extensive, customizable report module are further signs of a solid product.

QuickBooks will alarm some accountants, as it departs from standard accounting practices more than most packages do. Yet this "flaw" is also its major strength. While it doesn't provide a strict audit trail, QuickBooks offers accounting that is so easy to set up and operate that many users who would be intimidated by even a Peachtree or a Profit will use it faithfully. Operating on the theory that *some* accounting is worlds better than no accounting at all, QuickBooks fills an important void.

innovative use of graphics, helping users better understand accounting processes by providing visual readings of financial bottom lines. BestBooks, M.Y.O.B., and Peachtree Accounting for Windows all support flow charts, which clarify not only how processes are connected but also how information flows through your accounting system. The Profit Signs in Microsoft Profit feature informative, customizable graphs depicting key indicators, such as cash flow. QuickBooks also offers visual feedback in the form of more traditional graphs. Click on one of six charting selections, such as Income and Expenses, and you'll see a colorful pie chart. But there's innovation here, too: Double-click on one of the slices, and you'll see a more detailed breakdown of that category.

Windows provides a particularly suitable environment for small-business accounting, which tends to be a fragmented, not a linear process.

Drilling down—the ability to click on a line in a report, journal, or chart and see the underlying details—is superbly implemented in M.Y.O.B. and QuickBooks; with just a few mouse clicks, you can move from top-level summaries all the way down to your original transactions. In a pencil-and-paper system, or in a computerized one that lacks this ability, this kind of burrowing for detail could easily take hours.

READ MY LIST

Accounting also involves keeping numerous lists—of, say, customers, vendors, or inventory items—and using the information they comprise over and over. One way you can save a lot of time when filling out forms is to pop up a "pick list," select a name or item from it, and let the program fill in additional stored information, such as price, shipping address, and terms of sale. To access pick lists in QuickBooks, for example, you simply click the arrow that's ready and waiting next to any field that calls for list-based information. In BestBooks, you press Tab or Enter to see a list.

Generally, Windows accounting products offer more sophisticated aids to guide you through the complexities of financial management. Profit's Wizards, for example, walk you through processes such as company setup and end-of-period processing by asking questions and giving you lists of options so that you always know what to do next. Similarly, Peachtree's SmartGuides and QuickBooks' QCards offer concise on-screen explanations of the current action. These can be toggled on and off.

Windows accounting products may soon have another advantage over their DOS cousins. If accounting vendors follow the lead of other software vendors, DOS upgrades and support may slow down as companies concentrate their resources more on Windows development.

OFFSETTING ENTRIES

Exciting as some of these low-cost Windows accounting programs are, DOS packages still have the edge in a few areas. In general, DOS packages as a whole are substantially more full-featured. Distribution modules in Windows programs seem comparatively weak, inventory modules being the most clear-cut example. Companies with serious inventory-management needs probably won't want to take the Windows route—yet. On the other hand, having a feature-rich product isn't always an unalloyed advantage: Many smaller businesses can be overwhelmed by the number and complexity of features in its accounting package.

A potentially serious problem with all Windows applications, accounting packages included, is the frequency of system crashes—especially when running several applications simultaneously. Crash a word processor and you may have to spend a half hour reconstructing a document. Crash an accounting program—and lose data without a backup—and you're in big trouble.

Finally, of course, Windows applications require more powerful hardware than DOS applications; the added cost must be factored into the choice equation.

CHOICE POINTS

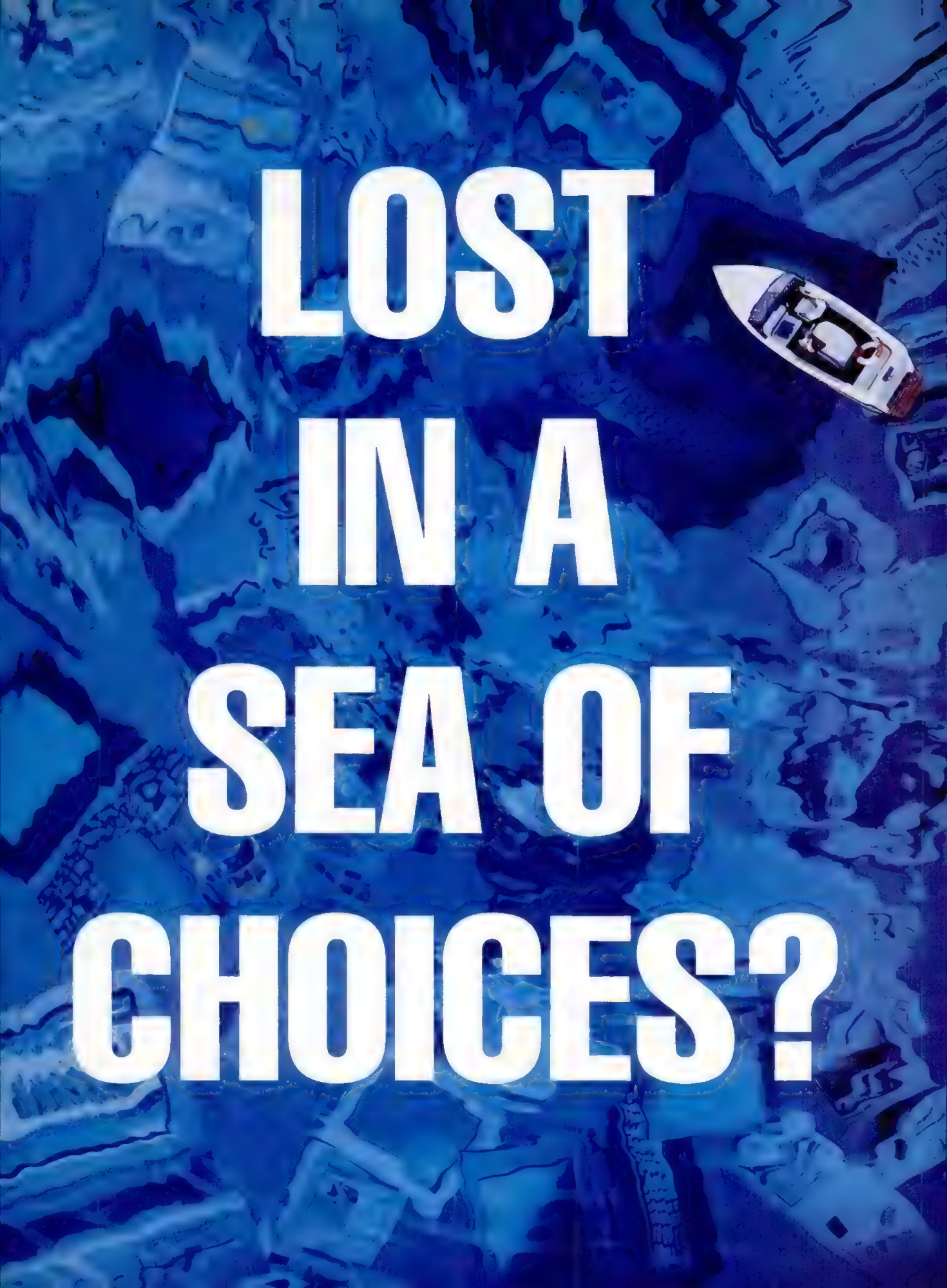
Your choice between an accounting program that adheres closely to standard accounting procedures (such as Peachtree or Service Industry Accounting) and a program that is less strict (such as QuickBooks) should depend in large part on how many people you want to have access to the accounting data. Many products have password security levels, which give unlimited access at the supervisor level, but restrict other users from hands-off activities (such as altering transactions). These security measures can help safeguard data in a multiperson accounting department. Programs with fewer built-in safeguards, such as CashBIZ and QuickBooks, are a little riskier in businesses where more than one person can edit transactions.

Most small-business proprietors should look for an accounting package that stores detail in such a way that they can easily go back and reconstruct the path of every transaction. Furthermore, if you use the services of a CPA, you may want to consult him or her before making a software decision—either to get recommendations or to see how a particular product will mesh with your accountant's data needs.

Finally, no matter what solution appeals to you now, you'll do yourself a disservice if you fail to consider the future. If you think you will need to move to a more powerful accounting system someday, do yourself a favor and plan for it today. This means that you will either have to select a more sophisticated package to begin with, or at least choose a product that has direct upward data compatibility to a more powerful package. If you don't plan for the future, you will eventually have to face the task of rebuilding your accounting system in another product.

If you're considering accounting software for the first time, your timing is great. Mature DOS products complement the rapidly growing numbers of innovative, easy-to-use Windows accounting applications that so well match the needs of small entrepreneurial businesses. Whatever you're looking for in the small-business accounting-software market, you'll probably find it. To put it simply, there's something for everyone out there right now.

LOST IN A SEA OF CHOICES?



Don't Be Dead In The

Set Sail For CompuAdd!

Chart a course for success with a CompuAdd notebook. Because our notebooks can take you any direction you want to go — from active matrix color to dual scan passive matrix color to 64 grayscale mono.

Your computing will be ship shape, too, because your notebook will be backed by CompuAdd's exclusive Risk Free Guarantee. Our support is a big reason why *PC Magazine* recently honored CompuAdd with its Service and Reliability award.

SERVICE & RELIABILITY · PC MAGAZINE · READERS' CHOICE

With a CompuAdd notebook, you'll always be able to catch the latest waves of technology. Because all our notebooks have PCMCIA slots, allowing you to upgrade simply by inserting a credit card size device. With PCMCIA you can zoom your data with a 14,400bps fax/modem. Tie into a network with a LAN adapter. Store data in a convenient, portable format. And be ready for still more upgrades in the future.

And when you need a desktop system, CompuAdd also has the power and flexibility you need. Pentium technology upgradability. CD-ROM drives on most systems. With CompuAdd, it's always full steam ahead!

intel inside

433TXC Notebook

9.5" Dual Scan Passive Matrix Color LCD Display

486DX/33MHz Intel SL-Enhanced Processor

200MB IDE Hard Drive

3.5" Internal Floppy

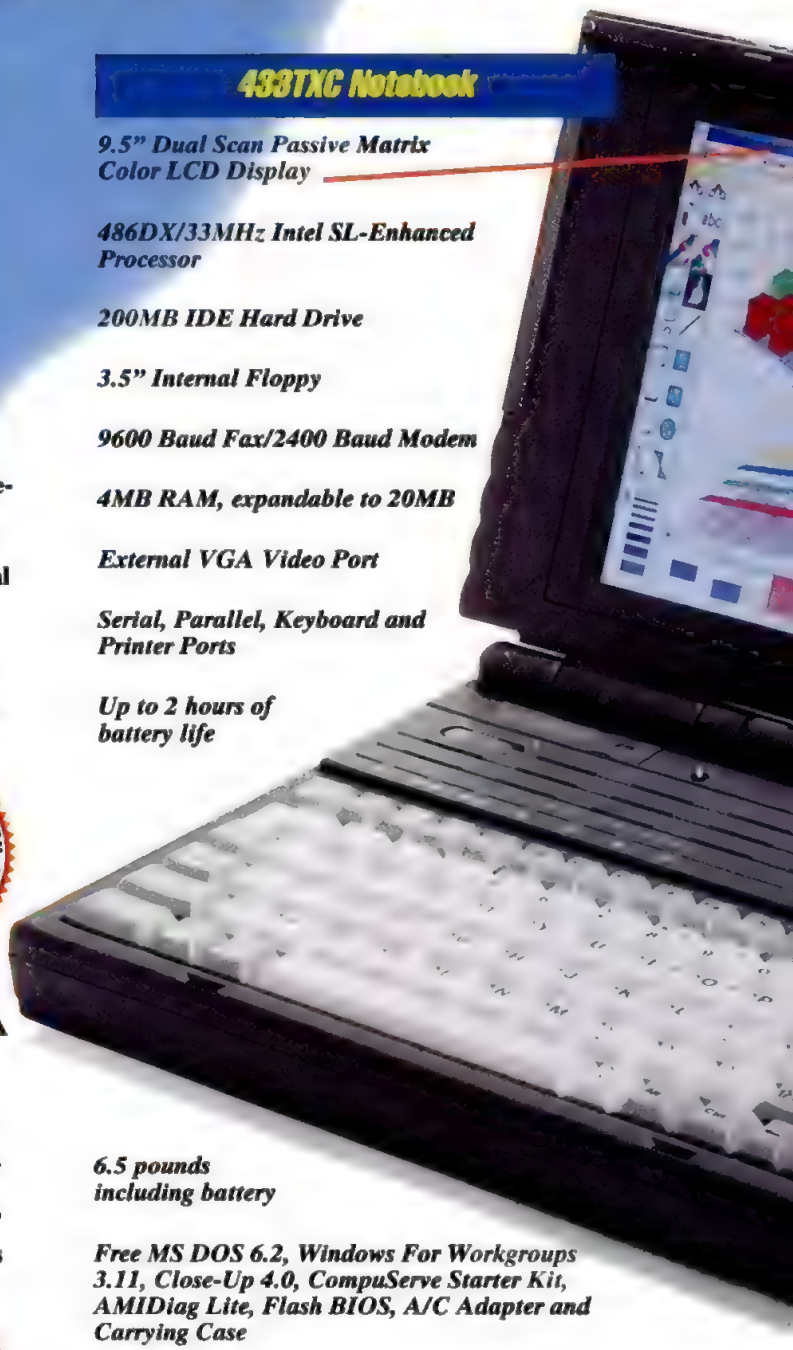
9600 Baud Fax/2400 Baud Modem

4MB RAM, expandable to 20MB

External VGA Video Port

Serial, Parallel, Keyboard and Printer Ports

Up to 2 hours of battery life



6.5 pounds including battery

Free MS DOS 6.2, Windows For Workgroups 3.11, Close-Up 4.0, CompuServe Starter Kit, AMIDiag Lite, Flash BIOS, A/C Adapter and Carrying Case

$2,895

Lease for only $105/mo.

CompuAdd

CUSTOMER DRIVEN, BY DESIGN.

Water!

intel inside

MICROSOFT. WINDOWS. READY-TO-RUN

425TXT Notebook

9.5" Active Matrix Color LCD Display
486SX/25MHz Intel Processor
200MB IDE Hard Drive
Up to 2 hours of battery life
6.1 pounds including battery

$3,495

Lease for only $121/mo.

425TX Notebook

9.5" 64 Grayscale Monochrome Display
486SX/25MHz Intel Processor
120MB IDE Hard Drive
Up to 3 hours of battery life
5.7 pounds including battery

$1,795

Lease for only $65/mo.

CIRCLE 126 ON READER SERVICE CARD

CompuAdd's Risk Free Guarantee Is Your Safe Harbor

30-Day Money-Back Guarantee
We're so sure you'll be satisfied with your new CompuAdd system that if you must return it within the first 30 days, we'll refund your purchase price. Just call for a credit return authorization.

Free Insurance
Your system is covered against theft and damage, even power surges, for 30 days FREE. You can purchase additional coverage from Safeware for less than 20 cents a day for most systems.

Remote Rescue Online Support
Using Close-Up 4.0, our technicians can access your system via modem and correct setup and configuration problems online — instead of relaying instructions for you to do it yourself.

Lifetime Technical Support
Our expert technical support staff will provide free telephone assistance for as long as you own your system.

One-Year Onsite Service on Desktops
During the first year, if you have a problem with your desktop system that our technicians can't solve on the phone, we'll ship replacement parts and dispatch an onsite technician. Free!

30-Day Price Protection
If we lower the advertised price of your new system within 30 days of your purchase, we'll refund the price difference.

One-Year Limited Warranty
If you have to ship your system in, we'll make repairs or replace defective parts in our factory without charge during the first year.

Lifetime BBS Support
You'll have access to our free technical bulletin board for as long as you own your system.

Out-Of-Warranty Repairs
We're here to support you even after your warranty expires. You can extend your desktop's onsite service option for a second or third year, purchase spare desktop parts or send in your system for repairs.

Onsite Installation Option
Our technicians can help you set up your desktop computers — from a standalone unit in your home to a multi-node network at your business. We'll even plan your network.

Environmentally Sensitive Packaging
The bezels on CompuAdd desktop systems are made from a recyclable plastic, and desktop shipping boxes are plain brown, unbleached cardboard. We pack with a new, low-density foam that reduces waste.

Call CompuAdd For Quick Delivery

800-289-9888

12303 Technology Blvd. Austin, Texas 78727

Hours: 7am-7pm (CST) M-F 512-250-2930 Fax 512-331-2862

©CompuAdd Corporation 1993. All rights reserved. Prices and specifications are subject to change without notice. CompuAdd is not liable for damage due to omissions or typographical errors. The Intel Inside® logo is a registered trademark of Intel Corporation. Pentium, Safeware, Close-Up, Microsoft and all other brands and product names are trademarks or registered trademarks of their respective companies.

Teleware Inc.

BestBooks

BY KATHY YAKAL

To attract small businesses that need more than a checkbook manager but less than a traditional small-business accounting package, Teleware shaved some functions from its popular M.Y.O.B. and, retaining the same interface, created BestBooks. Teleware, recently acquired by Best Programs, will be called Best!Ware as of this month. Priced at $99.95, BestBooks, Version 1.0, requires little setup and doesn't force you to follow every standard accounting procedure to the letter. But it lacks some of the airtight controls—such as a protected audit trail—found in most DOS-based packages. Still, if you're accounting-impaired and want to ease into the daunting task of true double-entry bookkeeping, BestBooks is a good first step and may be all you'll ever need.

SPEEDY SETUP

Work in BestBooks is centered around three categories: Checkbook, Purchases and Payables, and Sales and Receivables. Additional categories include Lists (of such things as accounts, jobs, invoice items, and shipping methods), a card file, and Administration (which includes a calendar and to-do lists). To-do lists are automatically generated to track such things as recurring transactions and unpaid sales and bills.

SUITABILITY TO TASK

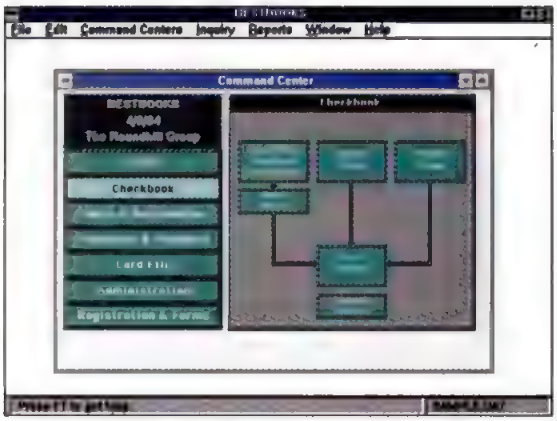
BestBooks

	POWER	EASE
General accounting	Good	Good
Managing cash	Good	Good
Managing inventory	Poor	Good
Managing information	Good	Excellent

Teleware's claim that you can be up and running with BestBooks in just a few minutes is not exaggerated. To get started, you choose from among the 31 sample charts of accounts. While the fact that you don't assign account numbers provides for a quick setup, it complicates the upgrade path to M.Y.O.B., which does require you to assign account numbers.

Next, you enter basic company information. You can customize your accounts list and enter historical data right away or as setup progresses. If you're a novice Windows user, BestBooks' progressively cascading windows may leave you hanging at times, as action buttons disappear off-screen.

The Command Center box on the opening screen displays the program's sections. Click on one, and a flowchart pops up, outlining (in clear English) the functions available. Then click on, say, Sales and Receivables and select Invoice Sales from a group of items. When an invoice appears, type in the customer name or press Tab or Enter to see a list. Once you've selected or entered a customer name, the date, address, sales tax, and finance terms are automatically filled in, and the invoice number is automatically incremented. The package will let you save the completed invoice as a recurring invoice, mark it as pending, or simply record it. New customers can be entered on the fly at any time. Other sections work similarly, and context-sensitive help is available at most screens.



All activity in BestBooks starts at the Command Center—a straightforward interface that's similar to the one found in M.Y.O.B.

HELPFUL FACTORS

BestBooks' documentation provides a brief accounting primer and glossary of terms, but it lacks a step-by-step guide to getting started. There is a small sample data set, but no tutorial—on-line or in the manual—save a small setup section. Technical support is free for the first 60 days, though, and the company's support technicians provide quick, accurate answers.

Since BestBooks does not require that you close periods (though it does allow closing through a series of simple steps), you don't use standard error-correction procedures. The package will let you simply delete (or edit) some kinds of transactions and void checks, but if you have to change an invoice that's been recorded as an actual sale, for example, you'll have to resort to a more complicated process, which is outlined in the documentation.

BestBooks has 60 predefined reports, and you can choose parameters to zoom in on the data you want. Options for customization aid layout design.

WEAK LINKS

In general, the program's reporting doesn't stand up to that of some other programs here. It lacks a report writer, true and consistent drill-down capabilities, charting, export links to spreadsheets (though you can export in ASCII format), and generous report parameters. And it's single-user only, though multiple password levels make it safe for more than one person to use on the same PC.

Other glitches and omissions mar this first release of BestBooks. For example, the sample letters promised in the documentation aren't there (although the mail-merge feature will let you export cards to your word processor). Sales-tax assignments default to the last sales tax assigned in invoicing. Further, there's no General Ledger module. And even though it's not graphics-intensive, BestBooks is slow—in screen redraws and especially in report generation.

Still, Teleware's idea of offering a scaled-down version of its award-winning M.Y.O.B. was sharp. The package's interface and language simplify bookkeeping for the mathematically challenged, though not as much as QuickBooks' do. If you run a small business with no extensive inventory or payroll needs, and you aren't bothered by not having all the elements of a complete double-entry accounting system, BestBooks is a good choice.

The Result Of A 12-Year Obsession.

For some people, creating software is just a job. For others, it's a non-stop obsession.

The latter is the case at Peachtree. Our people never stop searching for ways to make our software even better.

Now, the latest result of that 12-year commitment is here, with two significant new upgrades.

Peachtree Accounting For Windows, Release 2.0.

Already, the reviews are proclaiming this easy-to-use software as the undisputed champion in Windows accounting. That's on top of the fact that it was already the world's #1 selling Windows accounting software.

And at $169, it's not just a value. It's a steal.

Release 2.0 gives users G/L. A/R. A/P. Inventory. Customized Reports. Invoicing. Job Tracking. And Payroll. What more could any small business want?

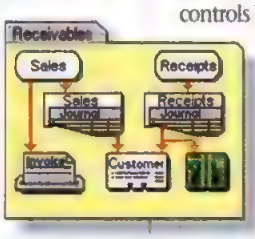
Well, that's what we asked. And you told us, in letters, phone calls, and usability studies.

As a result, we've added features like Smart Guides, with a Friendly Accountant that walks you through the software. Plus, there's a Navigation Aid to help you keep track of information. And it's fully networkable and multi-user at no extra charge.

ASK YOUR ACCOUNTANT

Peachtree Complete Accounting For DOS, Version 7.0.

Even with a dozen years of success behind it, the sound accounting principles and controls built into every copy of Complete continue to astound the industry. Accountants recommend it to their clients more often than any other PC accounting software.



And at only $249, it may be the best value in software of any kind.

There's even a new module: Order Entry. If your business deals with shipping or managing a warehouse, it's going to be a welcome addition.

For one price, Complete includes G/L. A/R. A/P. PO's. Budgeting. Payroll. Job Costing. Inventory. Invoicing. A custom report writer. And more. It's the most comprehensive off-the-shelf accounting system you can buy.

We're Not About To Stop Now.

After 12 years of continuous product improvement, you can be confident that the software you buy from us today will still be valuable tomorrow. We back our products with a nationwide network of authorized local Support Centers and a 60-day, money-back guarantee.

See for yourself what a difference an obsession with quality can make. See your dealer or call:

(800) 428-9973.

PEACHLINE. If you'd like to learn more about our line of Peachtree products for you and your customers, just call one of our accounting specialists at (800) 428-9973.

Peachtree®

The first name in small business accounting software.™

©1994 Peachtree Software Inc. Norcross, GA • All products are trademarks of their respective companies

CIRCLE 358 ON READER SERVICE CARD

▶FACT FILE
BestBooks, Version 1.0
Teleware Inc., 300 Roundhill Dr., Rockaway, NJ 07866; 800-322-6962, 201-586-2200; fax, 201-586-8885.
Circle 460 on reader service card

M-USA Business Systems

CashBIZ

BY KATHY YAKAL

M-USA Business Systems shocked the accounting software world when it released its powerful DOS-based Pacioli 2000 a few years ago and sold it for only $49.95. One of the company's latest products, CashBIZ, Version 1.0, sells for the same rock-bottom price but offers only a fraction of the functions. With a slower—albeit simpler—Windows interface, it's designed for cash-based businesses. It may, however, lack the horsepower to please most of these enterprises. Its Spartan feature set includes only check-writing, billing, and reports sections.

You can't argue with the program's simplicity, though. Setup takes just a few minutes, thanks to a Quicken-like checkbook-and-register central metaphor. You select from the two sample charts of accounts (home and business) and begin entering account details and transactions immediately, without first having to set up files of all of your customers and vendors. You can also import Quicken files directly, but there's a catch: Unless you first enter the name of every person or company from your Quicken transactions in CashBIZ's address book, your registers will import with blank payee fields. Also, CashBIZ is not network-capable and has only one level of password security.

SUITABILITY TO TASK

CashBIZ

	POWER	EASE
General accounting	Fair	Excellent
Managing cash	Fair	Excellent
Managing inventory	N/A	N/A
Managing information	Fair	Good

EASY INTERFACE

Besides icons, standard pull-down menus (comprising a scant few menu options) give you quick access to program functions. To set up accounts, select Accounts from the Activities menu and enter the account name, tax code, type of account, balance, and monthly budget. To write a check, select Checks from the Activities menu and click on a browse button to select the bank account and payee. If you type enough of the name for the program to recognize it and hit Tab, CashBIZ will fill the name in. If you type the first letter and Tab, you will get a browse box, from which you may select the name yourself. Then click on Apply to apply the check to any account. If you've memorized a regular payment, you can recall it here.

You can easily enter transactions directly in the register for anything that hasn't been entered in the Checks, Billing, or Cash Receipts screens. In the Account Register screen, you can click on buttons at the bottom of the Account Register screen to apply, memorize, or recall transactions. Highlight a line in the register and click Void to void a check. Choose Reconcile to begin reconciliation. You can also reverse a transaction here by clicking on the Reverse button with the line highlighted in the register. Since there's no General Ledger module, you can't trace the transaction; the invoice will still show the transaction but with an amount of zero and no indication that it has been reversed. While this is far from a fully GAAP-compliant transaction, it's an alternative to mere deletion.

The Invoice Data Entry screen is equally simple, but pretty skimpy on detail. Invoice-number, date, and due-date boxes default to the next sequential number and current date, but they can be overridden. CashBIZ doesn't have a browse button for lists of service or product items, so you'll have to enter them every time. And you can't record the name of a salesperson on the invoice. To document payment for invoices, you use the Cash Receipts screen.

Written documentation and context-sensitive on-line help are adequate enough, but some of the more sophisticated functions (such as reversing transactions) are not covered in enough depth for the novice.

CashBIZ's selection and depth of reports aren't particularly robust. There are 12 reports, including Aging, Balance Sheet, Budget, Cash Flow, and Statements, all of which will export in ASCII format. Customization is limited to data parameters and graphics layout options. No charts are available. You can, however, print mailing labels here, pulled from addresses you've entered in the program's Address Book. And you can auto-dial phone and fax numbers stored there, but CashBIZ only supports COM1 ports for auto-dial.

You may be a little irritated with the program's speed if your PC has less than today's fastest CPU. On a 486/66-based PC, a simple report generates almost instantly. On a 386/33, however, the same report takes about 35 seconds, and screen redraws dawdle for about as long. If you decide you need to upgrade to a more feature-laden program, you'll have to choose a product that imports data in Quicken format, since that's CashBIZ's only export option.

CashBIZ is marketed as a "home and cash-based business program," but it's really closer to today's personal finance products than it is to small-business accounting software. Unless you have a very small, cash-only business (and a very fast PC), you'd be wise to consider a different program—or wait for Version 2.0.

▶FACT FILE
CashBIZ, Version 1.0
M-USA Business Systems, 15806 Midway Rd., Dallas, TX 75244-2195; 800-933-6872, 214-386-6100; fax, 214-404-1957.
Circle 461 on reader service card

Computer Associates International Inc.

CA-Simply Accounting for Windows

BY STEVE GILLILAND

CA-Simply Accounting for Windows, Version 2.0 ($89), is unique among the Windows programs reviewed: It runs under Windows and as a native Workplace Shell application under OS/2. Also, it is designed for those with at least a nodding acquaintance with double-entry accounting. CA-Simply Accounting for Windows doesn't bend over backward to avoid mention of debits or credits, so it won't alienate your accountant. It sup-

ports cash- or accrual-basis accounting, has multilevel password protection, is network-ready as shipped, and can readily be transported upward to Computer Associates International's midrange BPI Accounting or high-range AccPac Plus.

The package's instant posting format requires manual reversing of entries to correct errors, but it also keeps a perfect audit trail. Because it doesn't use accounting periods, you needn't worry about closing the books each month, and you can print out complete financial reports at any time. It supports only two bank accounts and offers no provision for payment terms. Despite the program's traditional accounting flavor, the novice will find it friendly territory.

SUITABILITY TO TASK

CA-Simply Accounting for Windows

	POWER	EASE
General accounting	Excellent	Good
Managing cash	Fair	Good
Managing inventory	Good	Good
Managing information	Fair	Good

GETTING STARTED

Setup is straightforward, so long as you follow the steps in the manual. To be up and running, select whichever of the six sample charts of accounts that most closely matches your business, add or delete accounts as necessary, and enter the beginning account balances. The hands-on tutorial, accounting-basics manual, and getting-started manual are complemented by a workbook of common accounting procedures.

CA-Simply Accounting for Windows' interface is pictured as six icons: Accounts Payable, Accounts Receivable, General Ledger, Inventory, Payroll, and Project (known as Job Costing in other packages). Readying these modules involves, for instance, entering customer data in the A/R section and vendor information in the A/P section. Customers and vendors can be added on the fly, but you must first switch to the main screen and open the appropriate module. Entries in one of eight journals—Adjustments, General, Payments, Payroll, Purchases, Receipts, Sales, and Transfers—are automatically and immediately posted to all other affected ledgers and journals.

The package has visual snap. Checks and invoices are written on screens that look like real checks and invoices, and transaction entry is largely intuitive. To pay a vendor, you select the Payments journal icon and, in the blank check that pops up, enter the amount, select the vendor's name from a pop-up list (similar lists are available in all sections), and enter the vendor invoice number. The package automatically fills in appropriate fields for that vendor, credits the G/L bank account, debits the vendor's A/P ledger account, and simultaneously posts the entry to the G/L section. You can't customize checks or invoices, so you use the same on-screen form whether you deal in goods or services.

LEDGER CAPABILITIES

Transactions may be distributed among several accounts by dollar amount. The A/R and A/P sections accept full or partial payments, using the open invoice method, though you don't get detailed information on the invoices you're paying (such as what was purchased and when). Sales-tax percentages are automatically calculated, though there is provision for only one systemwide sales tax. Similarly, aging periods and finance charges are limited to one definition for the whole system. Only credit standings are definable for each customer.

The Payroll section supports automatic and manual deduction calculations, with up to seven income and eight deduction fields, including applicable state taxes. All 50 state-tax tables are included. Payroll fails to provide for pretax deductions such as those you'll face with a pension plan or 401k. The Inventory Control section tracks 32,000 items, notes reorder times, and permits item adjustment and transfers. The Project section follows revenue and expenses for up to 32,000 jobs. You can distribute project costs by dollar amount.

CA-Simply Accounting for Windows creates some 25 reports, though none are customizable beyond letting you set parameters like date ranges and customer, vendor, and employee names. Reports include the standard double-entry Balance Sheet, Income Statement, and Trial Balance, as well as invoices, statements, and aged detail and summary reports. There are also U.S. and Canadian tax reports, inventory quantity and reorder reports, and project summary and detail reports. You won't find graphing capabilities, but all screens redraw quickly, even on a 386/33 PC.

CA-Simply Accounting for Windows produces a full audit trail, but in doing so requires manual entries to reverse original debits and credits—necessary if you need to cancel an erroneous transaction. Also, you can't create classes of customers or vendors, there is no provision for individual customer or vendor payment terms, and there is no report writer.

Even with its faults, this is a good program, adequate for most small businesses. It's especially good if you run on a network and have a modicum of accounting knowledge. It's also well suited for businesses that may someday need to expand to Computer Associates' higher-capability accounting programs.

▶FACT FILE

CA-Simply Accounting for Windows, Version 2.0

Computer Associates International Inc., One Computer Associates Plaza, Islandia, NY 11788-7000; 800-225-5224, 516-342-5224; fax, 516-342-5734.

Circle 462 on reader service card

Central Computer Products

Do-It-Yourself Accounting

BY STEVE GILLILAND

The best thing about Do-It-Yourself Accounting, Version 3.21, is its price: free—save a $6.95 shipping charge—to anyone who calls Central Computer Products. The offer started in September 1993, and Do-It-Yourself will eventually sell for $69.95—the company hasn't announced when. But poorly written, poorly indexed documentation—both in the manual and on-screen—combine with program-crashing bugs to create an environment that's user-hostile and data-destructive.

Problems begin at setup. If you plan to work in the Accounts Receivable, Checkbook, or Invoicing section, you must choose the setup option that turns off automatic posting of invoices to the General Ledger section. If you don't, a payment entered in the checkbook will be double-

DOS Accounting Revisited

by Thomas White

The Windows-DOS debate is far from over in the accounting-software arena. Before moving to the Microsoft Windows side, take a good, close look at your accounting needs. Few would debate the ease of using a Windows accounting system, but these apps don't yet match the functionality of the leading DOS products.

The sophisticated features offered by DOS packages—such as serialized inventory, full Order Entry capabilities, consolidations, LIFO and FIFO costing, and strong multiuser capabilities—should attract midsize or growing companies and may in fact exceed a small business's needs.

The DOS appeal also extends to performance issues. DOS packages work well on a wider spectrum of hardware than do Windows packages—and more reliably. Also, in Windows you really need a speedy processor and plenty of memory.

To keep you in touch with the state of low-cost DOS accounting, we revisit three classics: DacEasy Accounting, M-USA Business Systems' Pacioli 2000, and Peachtree Complete Accounting. These are proven workhorses, laden with accounting features. You won't find built-in PIMs or pretty check-writing screens here—just accounting, and plenty of it. Though all three vendors have released Windows products (DacEasy for Windows should be out by the time you read this), each has expressed strong commitments to the DOS market and continued investment in product enhancements.

DACEASY ACCOUNTING

DacEasy (214-732-7500) was the first to offer a feature-rich accounting system at a rock-bottom price. Version 4.4 of DacEasy Accounting, $149.95, continues the upward-spiraling features trend. Modules include G/L, A/P, A/R, Billing, Cash Management, Purchase Order, Inventory, and the newcomer Fixed Assets.

DacEasy's account numbers can be up to ten digits and, through the use of account levels, you can define account roll-ups and reporting formats. G/L transaction types include both reversing and recurring entries, and transaction detail can be maintained for the entire fiscal year. DacEasy can maintain budgets by period for each account but not last-year or future-year budgets.

A Report Generator supplements DacEasy's standard reports. It is quite powerful, but a bit daunting at first. Fortunately, there are 19 sample reports to help you.

New in this version of DacEasy is the ability to create customized invoices, purchase orders, statements, and labels. Also, notes can be maintained for customers, vendors, and products. The Cash Management function handles transactions directly affecting cash, including receipts, payments, and adjustments. To round things out, DacEasy offers a well-designed bank reconciliation module. Those with high-volume bank statements will appreciate how easy it is to mark transactions as cleared and enter adjustments such as bank charges, interest earned, and corrections. A running balance is continuously displayed at the bottom of the screen.

DacEasy's Customer Analysis Report screen offers numerous selection options to filter data.

DacEasy's native billing function supports the sale of both products and services. While most small businesses will find this adequate, those with heavy order processing needs will want to consider the $199.95 Order Entry module. Prominent features here include tracking serial numbers of items sold, maintaining salesperson commissions, and printing picking slips and RMAs.

You can set up multilevel tax tables to calculate appropriate sales taxes, but these cannot be associated with the customer's ship-to address; no standard sales-tax reports are provided.

DacEasy's bill-of-materials function supports businesses with simple product-assembly needs. Inventory costing methods include standard, average, and last-purchase cost. An inventory-alert report lists items below minimum quantity levels. Payroll is offered at an additional price of $149.95.

PACIOLI 2000

When it was introduced several years ago, M-USA's Pacioli 2000 caused quite a stir by offering a relatively high level of functionality for a mere $49. Pacioli 2000, now in Version 2.0, consists of eight modules: G/L, A/P, A/R, Billing, Inventory, Purchasing, Budgeting, and Auditing. M-USA provides its separate Payroll module free to new Pacioli 2000 buyers; for others the module costs $25.

Experienced accounting users will quickly notice Pacioli's streamlined menu choices. With only four pull-down menus—and relatively few sub-choices—you would swear there wasn't much to this package. Once you see that Pacioli maintains its customers, vendors, and chart of accounts in one file, however, and that all invoicing and payable transactions occur on the same screen, you realize that there's more here than you originally thought.

Pacioli doesn't do much to help new users get started. Only one sample chart of accounts is provided, and the sample company doesn't include any

customers, vendors, or transactions. Furthermore, the on-line help is brief and simplistic. Fortunately, the manual goes into much greater detail, even including helpful Getting Started and Accounting Primer sections. Like DacEasy and Peachtree Complete, Pacioli includes look-up windows wherever appropriate.

The importance of numbering your chart of accounts is heightened with Pacioli because it includes your vendors and customers. The G/L maintains three years of budget and actual data and provides the flexibility to limit posting to specified periods. Version 2.0 provides for recurring and reversing transactions.

An auditing feature assists in the reconciliation of bank accounts and other account balances. You signify that a transaction has been cleared or reviewed by entering an electronic check mark. Users can't enter bank charges or other adjustments from this screen.

Pacioli's inventory module supports the sale of both products and services; multiple invoice formats are provided to support either type of sale. You can assign a default sales-tax rate to each customer, but Pacioli provides only limited sales-tax reporting. You can choose from five inventory costing methods: LIFO, FIFO, standard, average, and last. A New Prices feature automatically applies a percentage increase or decrease to the purchase price, sales price, or gross margin of any item—handy for companies that often alter their pricing.

Pacioli's standard reports are limited in number but flexible as to selection criteria and sort fields. There are only five A/R and A/P reports, and sales analysis reporting is lacking. You can create financial statements by using Pacioli's Report Generator. This powerful report writer can produce complex, 14-column financial spreadsheets.

For those requiring still more accounting features, M-USA will soon offer Mondial, a $199.95 DOS-based accounting system. Its more notable features include multicurrency conversion, multiwarehouse inventory, item assembly control, job cost, and point of sale. Mondial should be available by the time you read this.

Pacioli 2000's unique Purchase/Sales Transaction screen processes customer invoices or product purchases based upon the transaction type you choose.

PEACHTREE COMPLETE ACCOUNTING FOR DOS

Peachtree Software's Peachtree Complete Accounting for DOS, Version 7.0, incorporates 140 new features, including an Order Entry module. The full package ($249) consists of nine modules: G/L, A/P, A/R, Invoicing/Order Entry, Inventory, Payroll, Purchase Order, Job Cost, and Fixed Assets.

Peachtree's robust Invoice screen includes a separate ship-to address, multiple tax jurisdictions, the ship date, and document-status indicators.

Peachtree Complete's G/L supports account numbers of up to six digits, the last two being dedicated to departmental reporting. Furthermore, you can produce consolidated financial statements for up to 32 subsidiary companies, as long as the account-number length is consistent for all companies.

You can maintain budgets by account for each period in current, prior, and future years. Transaction detail can remain on-line for the entire fiscal year but will be deleted during the year-end close.

Peachtree Complete now lets you enter default payment terms in the master vendor record, so terms are automatically inserted during invoice entry. This much-needed enhancement speeds data entry and minimizes errors.

You can distribute an invoice to a maximum of eight G/L accounts. Peachtree Complete allows up to 35 separate checking accounts; a separate Bank Account Manager system, $79, helps you reconcile them.

Quotes and orders are entered from the same screen as invoices, minimizing training time. You can convert quotes to orders or invoices by running a Convert option, or you can "insert" lines from an existing quote into an order or invoice. You can format quotes, orders, invoices, statements, and picking slips and lists.

Default customer information has been expanded in Peachtree Complete. Separate sales-tax codes are now assigned to each ship-to address, a must for companies that sell to many different tax jurisdictions. Each customer is now assigned a default price code, better ensuring accurate pricing.

Peachtree Complete's inventory module supports the sale of products or services from a single warehouse location. Each product can be assigned one of five costing methods: standard, average, specific unit, LIFO, and FIFO. You can define a bill of materials for items you assemble. A simple build feature increases the quantity of assembled items while correspondingly decreasing the quantity of component items. Peachtree Complete also tracks serialized items.

For specialized reporting needs, Peachtree Complete includes a Data Query module. Based upon the popular IQ report writer, it lets you create and save custom reports, queries, and graphs. □

posted to both the G/L Cash and G/L Revenue accounts. Therefore, you must instead manually enter the A/R account number after you make a deposit.

As you continue, you'll discover there is no Accounts/Payable section. That means there are no purchase order forms and no way to tell your bookkeeping system what or how much you buy except via the check register. The vendor database is used only for writing checks.

The sample chart of accounts is rudimentary, and can be changed. Still, it remains possible to delete an account that has a balance. Should you do this, documentation warns quietly, the results will be an out-of-balance system, a situation for which Do-It-Yourself doesn't offer any help to correct.

Do-It-Yourself includes the following sections: A/R (also called Payments), Bank Reconciliation, Checkbook, G/L, and Invoicing. Payroll is both a separate icon and a separate program in the Windows Program Manager, unreachable from within Do-It-Yourself. There is no upgrade path to other programs.

SUITABILITY TO TASK

Do-It-Yourself Accounting

	POWER	EASE
General accounting	Fair	Poor
Managing cash	Poor	Poor
Managing inventory	Poor	Fair
Managing information	Poor	Poor

MISSING PIECES

The Windows interface is nice-looking, with a menu bar and an icon toolbar. Checks and Invoices screens resemble paper checks and invoices. Four of the icons, however, lead to Windows accessories (calculator, calendar, clock, and notepad); the forms icon merely tells you how to order the specific forms Do-It-Yourself demands. The package offers only one level of passwording, and there is no network version.

Furthermore, entering transactions in Do-It-Yourself is a real adventure. For example, it's one thing that the help screens—accessible from the uppermost menu bar—aren't context-sensitive. It's another that they're booby-trapped: When you open any screen—to enter a check or an invoice, for instance—a toolbar that conceals another help button appears at the bottom of the screen. You must use that second help button for assistance while a screen is open. Should you forget (and this hazard isn't documented) and click on the help button at the top of the screen, the system can freeze, creating unfixable havoc in data files and requiring a cold boot to restart. Technical-support staff report that this can happen if there are "insufficient system resources." It happened to us—every time we tried—on a 4MB system with no other Windows applications open.

Writing a check or filling out invoices is eased by pop-up lists of customers and vendors. But if you err in an invoice customer data field, you can't back up to that field after you've moved to the item, description, or price field. Try too hard—press Shift/Tab, for example—and the system locks up. Similarly, errors in check payee and dollar amounts can't be reached after you move to the distribution fields on the same screen.

SILVER LINING

With fatal pitfalls so prevalent, it's difficult to call any program feature positive, but there are some. Batch posting makes for simple error correction—until you've posted. After posting, reversing entries is required, and the documentation says nothing of how to do this.

The package does provide helpful and easy-to-use check reconciliation and a budgeting feature that produces budget, actual, and variance reports. Do-It-Yourself can produce 13 other reports, including an Historical Inventory report telling you who bought how many of which inventory item during the previous month. All reports are printed to screen using the Windows notepad, so they can be edited with your word processor. Do-It-Yourself has no charting or graphing capability.

The Payroll program is fairly extensive, offering salary and hourly pay methods, as well as four different payment cycles. Tax tables for all 50 states are included. There are time and payroll worksheets and nine Payroll reports (also printed to the notepad). One feature found in none of the other programs is the provision for withholding child-support payments.

Do-It-Yourself looks as though it might have had the potential to be a useful accounting tool for small businesses. Unfortunately, in its current state of development, erratic behavior renders it too dangerous to trust with your business's financial well being.

▶FACT FILE

Do-It-Yourself Accounting, Version 3.21
Central Computer Products, 330 Central Ave., Fillmore, CA 93015; 800-373-3946, 805-524-4189; fax, 805-524-4026.

Circle 463 on reader service card

Microsoft Corp.

Microsoft Profit

BY STEVE GILLILAND

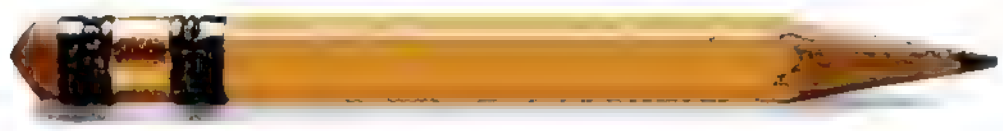
Version 1.0 of Microsoft Profit ($199), the industry giant's first venture into the accounting field, brings a refreshing new look and feel to the low-cost Microsoft Windows accounting software market. At the same time, it brings a new near-credibility to the often-abused claim of "sophisticated accounting for the non-accountant." Indeed, Profit's double-entry accounting is so adroitly hidden that it almost entirely avoids mention of debits or credits. Furthermore, Profit Signs—visual tools for analyzing your business's health—give you a clear and easy look at your vital numbers.

Setting up the chart of accounts, traditionally a tough task for the inexperienced user, is almost fun in Profit. Setup is prefaced by an entertaining interactive tutorial and supervised by one of Profit's six Wizards, which are on-screen walk-through guides to setup procedures. The Setup Wizard asks you questions about your business; for instance, Products or services? Retail or wholesale? Based on your responses, Profit creates a chart of accounts tailored to your business. You can alter the chart of accounts that Profit cooks up for you, or you can create your own chart from scratch.

PROFITABLE WIZARDRY

Profit also provides Wizards for bank reconciliations, closing a period, budgeting,

We didn't sleep through the PC revolution.



We took notes.

t. Better results.

tame even the power-hungriest graphics, multimedia and scientific programs.

Okay, other members of your workgroup may not give a hoot about MHz, PCI or RISC. But they will like being able to create graphics, access CD ROM applications or pull information from anywhere in the network—all at once—without breaking stride.

DOS,™ OS/2,™ UNIX,™ Windows or whatever, you can be sure your DECpc XL will run it fastest.

They're even priced to go fast. None of this good stuff would mean very much if it cost a fortune. So maybe the best news of all is that you can get an i486 pc XL starting from $2,599.

Or you can pay *more* for a box that runs slower, won't accept both Alpha AXP and Pentium processors, doesn't have a high-speed PCI bus, and can't be upgraded over lunch.

too. Not just the

'son using it.

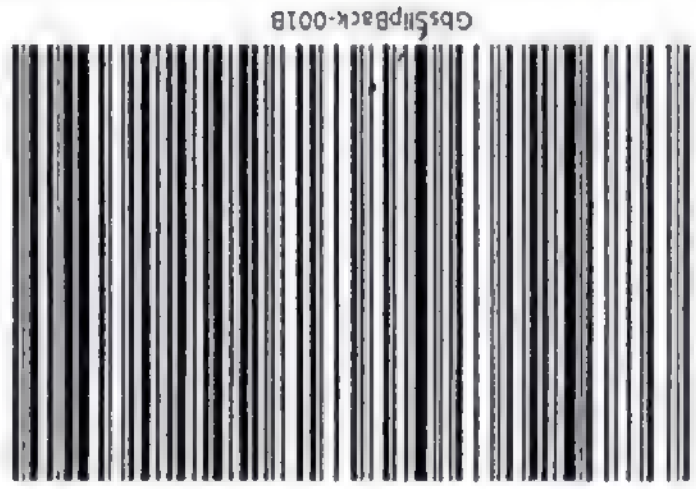
Fact is, each DECpc XL is powerful enough to function as a small workgroup server all by itself. Even with multi-tasking operating systems like WindowsNT.™

But whatever operating system you're already using,

We don't think you'll need an XL to figure that one out.

Inverted Back

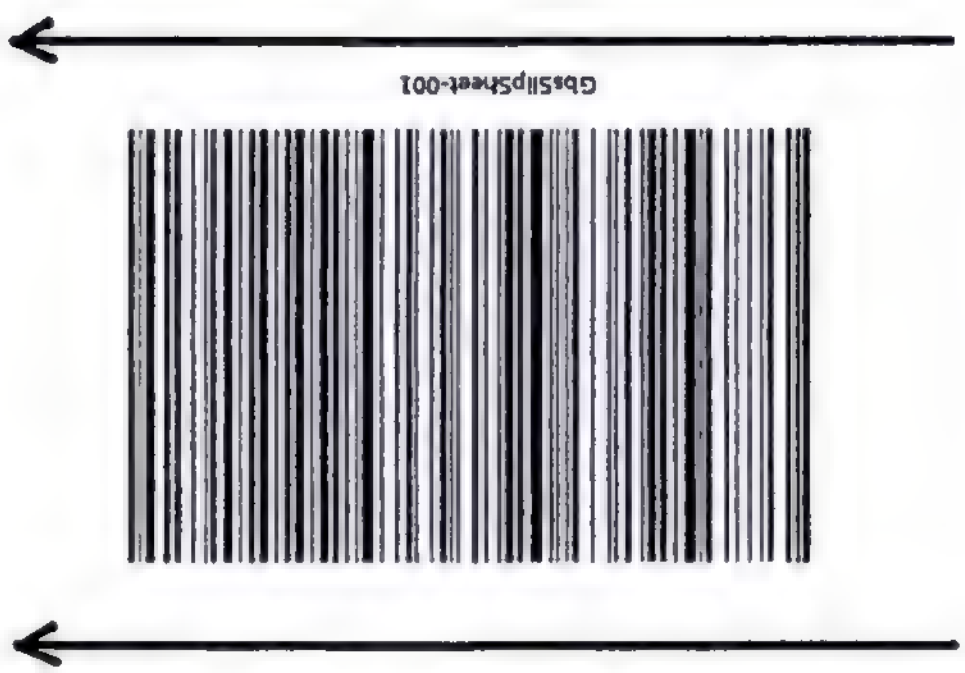
1. Follow instructions on the other side



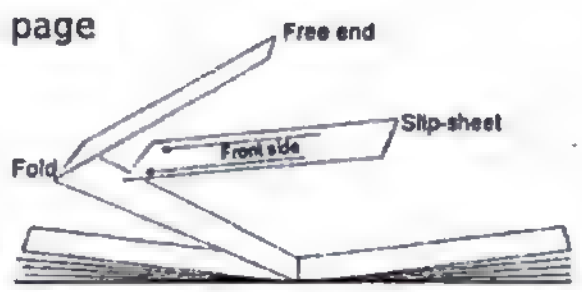
Back

1. Follow instructions on the other side

Folded edge of the page

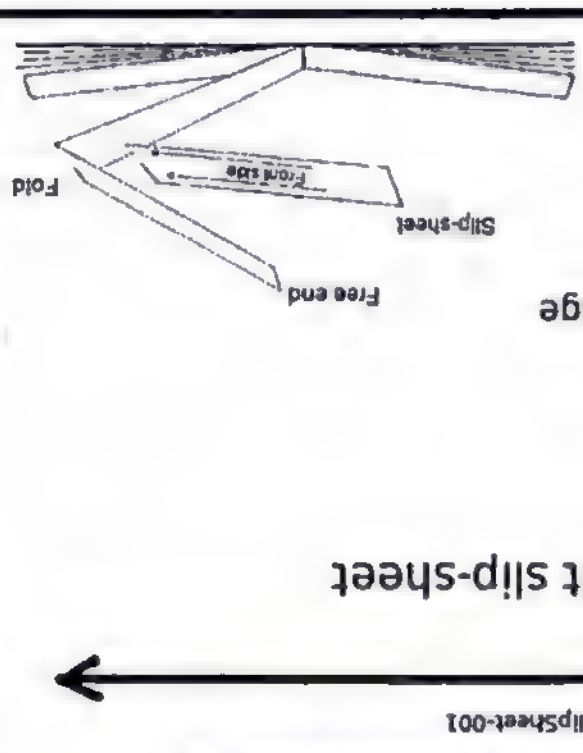


1. Open the foldout page
2. Insert this sheet with
   1. Front side touching the free page
   2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
   1. Front side touching the free page
   2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Greater outpu

Grind. Log. Print. Crunch. Search. Write. Fax. Import. Share. Send.

Our new DECpc XL helps you perform better no matter how many balls you're juggling.

Download. Create. Revise. Edit. Link. Upload. Receive. View. Review.

And it'll help you keep them all going at once while dropping nary a one.

So you don't just get a better box, you get a better return on your investment.

It's one line you won't have to wait on. The new DECpc XL is available in four models—from 33MHz i486 on up to 66MHz Pentium processors.

Of course, that's just clock speed. In real life—like on your desk—you can expect to leave ordinary boxes in the dust.

That's because our XLs *already* take full advantage of the new industry standard high-speed PCI local bus. This unburdens your processor, unleashing its full power.

That means sluggish applications start to fly. High-speed peripherals kick into high gear.

And graphics? On XL, your

Faster,

charts and images will pop up on screen *faster than on any other PC* in the land. That's because the DECpc XL is rated at more than 80 million WINMarks.*

but the per

And, of course, when you've got a really fast-moving PC, you can run faster, too. Ain't technology grand?

All the power a power-user can use. With up to 192MB of RAM and lightning reflexes, your XL can

Introducing the

We've noticed a lot of companies sell really fast PCs that aren't really very fast.

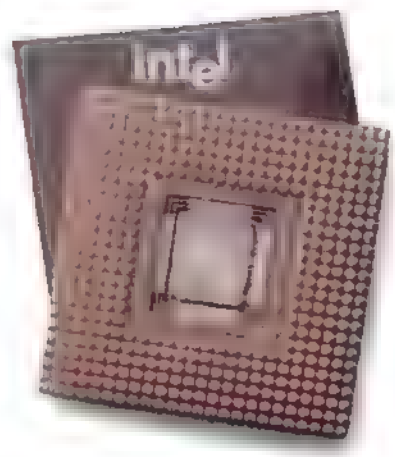
Not once you load them up with Windows™ or put them on your network.

To us, none of this makes sense.

What does make sense are our four new DECpc XLs.

We took our time.

Performance you don't have to wait for. Our XLs use the same hot i486™ and Pentium™ processors others give you. But in an XL, these run a whole lot faster.



In fact, our new XL series includes the fastest i486 *and* Pentium processor-based PCs on the market today. Period.

That's because the CPUs are mated to the new PCI local bus—the new industry standard that runs like blazes (in other words, 32 bits at up to 33MHz) while handling all the peripheral folderol that the processor used to.

We also put in write-back cache to speed the processor even more.

The result? You spend a lot more time working, and a lot less watching an hourglass icon. But what if someday you need more?

How about a quick upgrade to say...150MHz? Our XLs give you room for more memory and hotter video right off the showroom floor. And when you're ready for more speed, just plug in a *daughtercard*.

waste yours.

This little marvel lets you *completely replace* your i486 chip with a Pentium processor—not merely add a Pentium OverDrive™ processor like the

DECpc XL™ series.

other guys do—in nothing flat.

If this still isn't enough for you, then plug in a 150MHz Alpha AXP daughtercard. You'll have big daddy RISC workstation and server capabilities, just like that.

Can a hot chip run too hot? Not on the XL, it can't.

Its *intelligent fan cooling* directs air

Plus, XL already comes with bi-level 5/3.3 volt power for today's and tomorrow's processor technologies.

"Best system overall." Those are *PC Week*'s words*—not ours—for the DECpc XL with Pentium processor.

So what's the lesson in all this?

So we wouldn't

when and where it's needed most. So XL uses less power and runs quieter with any chip.

Simple. You may want to run your PCs in a hurry. But that's certainly no way to build them.

*November 15, 1993

digital™ PC

Beyond the box.

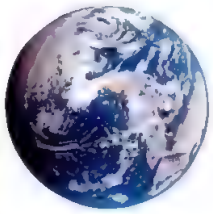
Is it any wonder we're the largest direct-order computer supplier in the world? Yes, even bigger than IBM, Dell, Compaq or Gateway.

First, your purchase is backed with a 30-day, no-questions-asked guarantee. If you don't like it, it's history.

Then, your system is supported by Digital's full three-year† warranty. And for one full year, we'll support your DOS, Windows or WindowsNT operating system, too.

And wherever you do business, we have over 30,000 service representatives around the world to see that you're satisfied.

Don't waste another minute, call today.



So just tell us which system you want. And if you don't see what you need on these pages, call anyway. We'll custom-configure a system to your needs and budget, and get it to you before you know it.

With PCs this fast, we wouldn't want to keep you waiting.

1 800 215-8766

Please reference BNJ when you call. 8:30 a.m. to 8:00 p.m., Mon.-Fri. ET. Call us for ordering information or for the name of your local Digital reseller.

*Based on October 1993 BAPCo and WINbench tests. †Three-year limited hardware warranty. Certain restrictions and exclusions apply. Warranty service on PC notebooks is return-to-factory. Monitors, batteries and peripherals covered by a one-year warranty.

Of course, a DECpc XL may be a little too hot for some tastes. That's why we have a complete line of value-priced i486 PCs with the same reliability and quality engineering we packed into our XLs—for as little as $1,348. For other Digital PC models from notebooks on up, see back of the next page.

XL,

By thinking beyond the box, we put some great thinking into the box. And obviously, we're not the only ones who think so.

Finalist

World's fastest i486 PC

DECpc XL 433dx

- i486DX/33MHz
- 128KB cache
- 8MB RAM
- 340MB SCSI hard drive
- 3.5" 1.44MB floppy drive
- On-board PCI SCSI-II
- Double-speed SCSI CD-ROM*
- S3 928PCI Video Adapter
- 15" SVGA LE, NI monitor recommended*
- MS-DOS 6.0 and Windows 3.1
- Upgradable to Pentium OverDrive,™ full Pentium processor and Alpha AXP processor
- Easy-access enclosure

$2,599 *$91/mo. lease*

Pentium processor PC

DECpc XL 560

- 60MHz Pentium processor 256KB cache

$3,699 *$129/mo. lease*

*Optional. Not included in price.

digital™

PC

Beyond the box.

Whatever your specs, we've got a PC to fit them. Call us on it.

SL NOTEBOOKS

25MHz i386SL (mono)	$2,149
25MHz i386SL (passive matrix color)	$2,699
25MHz i486SL (mono)	$2,499
25MHz i486SL (active matrix color)	$3,999

Lease for as low as $75/month

4MB RAM
64KB cache
120MB removable hard drive
2 PCMCIA slots

3.5" floppy drive
MS-DOS 6.0 and Windows 3.1
BitFAX/BitCOM software
6.5-hour NiMH battery
AC adapter
Snap-on trackball

LPv SYSTEMS

25MHz i486SX	$1,348
33MHz i486SX	$1,448
33MHz i486DX	$1,698
50MHz i486DX2	$1,798
66MHz i486DX2	$2,098

Lease for as low as $47/month

Local bus SVGA video
GUI accelerator
4MB RAM
1MB video RAM
170MB hard drive
3 ISA slots
4 drive bays

3.5" floppy drive
14" SVGA(i) color monitor
MS-DOS 6.0 and Windows 3.1
Mouse
101-key keyboard

LPx SYSTEMS

33MHz i486SX	$1,598
33MHz i486DX	$1,848
50MHz i486DX2	$1,948
66MHz i486DX2	$2,248

Lease for as low as $56/month

VESA-VL bus GUI accelerator
4MB RAM
S3 805 1MB video RAM adapter
170MB hard drive
6 ISA slots (2 VESA-VL slots)
5 drive bays
OverDrive processor upgrade

Pentium™ OverDrive processor upgrade
3.5" floppy drive
14" SVGA(i) color monitor
MS-DOS 6.0 and Windows 3.1
Mouse
101-key keyboard

MTE SYSTEMS

33MHz i486DX	$2,698
66MHz i486DX2	$2,998

Lease for as low as $94/month

DECEMBER 1993
BYTE
BEST OVERALL
BEST GENERAL PURPOSE
SYSTEM

6 EISA slots with 1 VESA-VL
Local bus SVGA video slot
GUI accelerator
8MB RAM
128KB cache
1MB video RAM
245MB hard drive
5 drive bays
3.5" floppy drive

Pentium OverDrive processor upgrade
14" SVGA(i) color monitor
S3 805 video adapter
MS-DOS 6.0 and Windows 3.1
Mouse
101-key keyboard

XL SYSTEMS

33MHz i486DX	$2,599
66MHz i486DX2	$2,999
60MHz Pentium	$3,699
66MHz Pentium	$4,299

Lease for as low as $91/month

8MB RAM (expandable to 192MB on board)
340MB SCSI hard drive
144MB 3.5" floppy drive
Double-speed SCSI CD-ROM*
S3 928PCI video adapter
1MB video RAM (expandable to 2MB)
15" SVGA, LE, NI color monitor*

6 slots (2 PCI, 3 ISA, 1 ISA/PCI interleaved)
128/256KB cache
5 drive bays
On-board PCI SCSI-II
MS-DOS 6.0 and Windows 3.1
Upgradable to Pentium OverDrive, full Pentium and Alpha AXP processors

*Optional. Not included in price.

1 800 215-8766

Please reference BNJ when you call. 8:30 a.m. to 8:00 p.m., Mon.–Fri. ET. Call us for ordering information or for the name of your local Digital reseller.

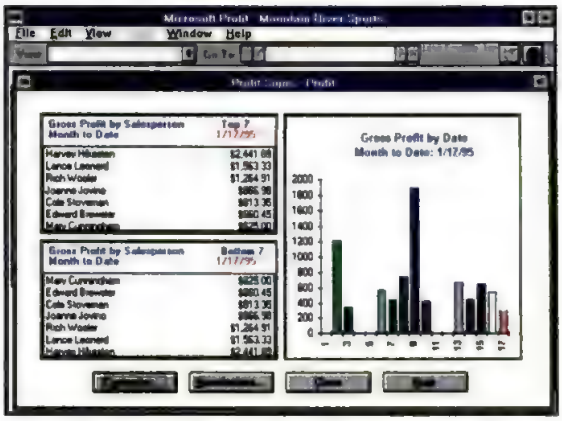
© DIGITAL EQUIPMENT CORPORATION, 1993. The DIGITAL logo, DECpc and AXP are trademarks of the Digital Equipment Corporation. Beyond the Box is a service mark of the Digital Equipment Corporation. OverDrive, Pentium, i486 and the Intel Inside logo are trademarks of Intel Corporation. Windows is a trademark and MS-DOS is a registered trademark of Microsoft Corporation. Digital believes that the information in this advertisement is accurate as of its publication date; such information is subject to change without notice. Digital is not responsible for any errors. Actual monitor may differ from that shown. Not all products available worldwide.

billing, and producing mailing labels. Excellent context-sensitive help and a thoughtfully designed manual build user confidence. There is no accounting primer or glossary, but the chart showing the flow of information as you enter transactions is helpful.

Customer support (provided by Great Plains Software, Profit's developer) costs $249 annually. BBS access is $60 annually.

Also, Profit ships network-ready, but Microsoft requires purchase of a five-user "License Pak" before installing Profit on a network. Furthermore, multilevel password protection is provided for all areas of the program.

Profit has no upgrade path to more accounting and management sophistication, nor does it implement DDE or OLE. It is, however, able to produce reports in Microsoft Excel and Word for Windows formats.



The Profit Signs in Microsoft Profit show you myriad ways of looking at your finances. You can create customizable charts for further analysis.

INVISIBLE ACCOUNTING

Profit approaches the daily details of accounting differently than most packages do. Instead of opening an accounting-specific module—A/R or A/P, for instance—

SUITABILITY TO TASK

Microsoft Profit

	POWER	EASE
General accounting	Excellent	Excellent
Managing cash	Excellent	Excellent
Managing inventory	Good	Good
Managing information	Excellent	Excellent

you open one of six iconic "drawers" in Profit's File Cabinet. The six icons are Transactions, Cardfile (for vendor, customer, and inventory databases), Reports, Wizards, Profit Signs, and—last and least prominent—Accounting.

Once the system is up and running, users will typically spend most of their time in Transactions. Under Transactions, for example, you're asked if the transaction is with a customer, vendor, employee, or bank. Your answer brings up the appropriate form: an invoice for sales, a purchase order for vendors, a check for paying bills, or a deposit or withdrawal slip for banking. As you enter transaction data, Profit figures sales tax, debits and credits relevant journals, updates customer/vendor information and inventory items, and applies the data to Profit's project module. This module lets you track progress and expenses for individual projects. When you select a customer or vendor from the pop-up list, the Smartfill feature automatically fills in data such as the name, the address, taxes, and discounts.

Profit Signs, a set of graphical snapshots of your business's condition, comprise Profit's strongest feature. The package includes six Profit Signs, each of which provides an at-a-glance look at different elements of your business's welfare. For example, the Business Summary Profit Sign supplies you with a graphical and textual synopsis of the week's gross sales, cash balance (from all bank accounts), and an accounts receivable and payables summary. Other Profit Signs automatically calculate and display the status of cash flow, profit, inventory, or individual projects. You can customize the contents of these graphs, but you cannot save multiple graph settings.

FLYING UPDATES

You can update the Cardfile databases on the fly, and the Accounting icon offers access to tasks such as chart of accounts modification and entry adjustment. The Report icon runs and prints a generous selection of 35 preset reports, including a set of financial statements that includes a comparative balance sheet and statements of retained earnings and change in financial position, as well as an FASB 95 cash-flow statement. Most screens in the program can also be printed, complementing the preset reports. Unfortunately, there is no custom report writer, and though many forms can be tweaked (such as from/to dates, comparison parameters, and range of customers), major changes to report output are not supported.

Inventory items are tracked using weighted averages, and you can create invoices for noninventoried items as well as services. Profit handles sales tax, finance charges, payment terms, and aging, albeit with limitations. You can create up to 99 different sales tax rates and 12 payment terms (such as Net 30, cash, and C.O.D.) but just two finance charges—an annual or monthly percentage amount. Microsoft and Great Plains plan to offer a Payroll module by the end of 1993. For the present, Profit offers only rudimentary payroll help.

Profit has some rough edges. It's quite slow, needing about 18 seconds to load on a 386/33, and it grabs almost 9MB of hard disk space. Error correction after posting requires a reversing entry, exactly reversing debits and credits for the erroneous transaction, but nowhere in documentation or help screens is there any hint of how to do this. There are some workarounds: You can correct a check by voiding it, and issue Invoice refunds, but common errors such as an incorrect invoice amount require a reversing entry. A potential annoyance is that there is only one ship-to address for customers.

Despite these negatives, Profit emerges as an outstanding choice for small businesses; it will be even better when the Payroll module is added. Profit offers double-entry precision while demanding little accounting knowledge, and its Profit Signs provide graphical business analysis tools unique in low-cost accounting programs.

▶FACT FILE

EDITORS' CHOICE Microsoft Profit, Version 1.0

Microsoft Corp., One Microsoft Way, Redmond, WA 98052-6399; 800-426-9400, 206-882-8080; fax, 206-883-8101.

Circle 464 on reader service card

▶ SUMMARY OF FEATURES

Small-Business Accounting

Products listed in alphabetical order ■ = YES □ = NO	BestBooks	CashBIZ	CA-Simply Accounting for Windows	Do-It-Yourself Accounting	Microsoft Profit (PC MAGAZINE EDITORS' CHOICE)	M.Y.O.B.	Peachtree Accounting for Windows (PC MAGAZINE EDITORS' CHOICE)
List price	$99.95	$49.95	$89.00	$69.95 (free to first 100,000 customers)	$199.00	$199.95	$169.00
General Features							
Upgrade available	■	□	■	□	□	□	□
Password security	■	■	■	■	■	■	■
Network version available	□	□	■	□	■	□	■
Context-sensitive help	■	■	■	□	■	■	■
On-line/printed tutorial	■■	□□	■■	□□	■■	■■	■■
On-line/printed glossary	■■	■□	■■	□□	□□	■■	■■
Number of sample account charts	31	2	6	1	9	6	12
Sample data	■	□	■	□	■	■	■
DDE/OLE/OLE 2.0 support	□□□	□□□	■□□	□□□	□□□	□□□	■■□
User can enter transactions before setup is complete	■	■	■	■	■	■	■
Data-entry automation	□	■	■	■	■	□	■
Error-correction method	Delete/correct	Delete/correct	Reversing entry	Delete/correct	Reversing entry	Delete/correct	Delete/correct
Master file lookups	■	■	■	■	■	■	■
Allows cash basis	■	■	■	□	□	■	■
Business status indicators:							
Number of graph types	None	None	None	None	3	None	3
Customizable graphs	N/A❶	N/A❶	N/A❶	N/A❶	■	N/A❶	□
Drill-down analysis	■	□	■	□	■	■	■
Report writer	□	□	□	□	■	□	■
Real-time report updates	□	□	■	□	■	■	■
Customizable reports	□	□	■	□	■	■	■
Exports reports to text file	■	■	■	■	■	■	■
Imports/exports vendor information	■■	□■	□■	□■	■■	■■	■■
Imports/exports customer information	■■	□■	□■	□■	■■	■■	■■
Period processing:							
Future period processing	■	■	N/A❶	■	■	■	■
Compresses period detail	■	□	□	□	□	■	■
Maximum number of open periods	Unlimited	Unlimited	Unlimited	12	13	26	26
Printing:							
Prints reports to screen	■	■	■	■	■	■	■
Prints reports to file	■	■	□	■	■	■	■
User-customizable forms:							
Statements	■	□	□	□	□	■	■
Checks	■	□	□	□	□	■	■
Invoices	■	□	□	□	□	■	■
Annual technical-support fee	$79.95	$50.00	$75.00	$200.00	$249.00	$79.95	$99.00
General Ledger Module							
Account number structure (in alphanumeric characters)	N/A❷	N/A❷	4	10	5	5	10
Number of budgets per account	1	1	None	1	1	1	1
Automatic reversing/recurring entries	□■	□■	□□	□□	■■	■■	■■
Allows entry of next year's budget during current year	□	□	□	□	□	□	■

N/A❶ —Not applicable: The product does not have this feature.
N/A❷ —Not applicable: The product does not use an alphanumeric code in this context.

CONTINUES

PC MAGAZINE	
QuickBooks for Windows	Service Industry Accounting
$159.00	$299.00
□	■
■	■
□	□
■	□
■■	■■
■■	□■
20	1
■	■
□□□	■□□
■	■
■	□
Delete/correct	Reversing entry
■	■
■	□
6	1
■	□
■	□
□	□
■	■
■	□
■	■
■■	■■
■■	■■
■	□
□	■
Unlimited	12
■	■
■	■
□	■
□	□
□	■
Free	$150.00
7	10
1	1
□■	■■
■	■

Teleware Inc.

M.Y.O.B.

BY THOMAS WHITE

Version 3.0 of M.Y.O.B. combines PIM functions (including to-do lists and a contact manager) with strong inquiry capabilities to manage your small business effectively. This $199.95 package is among the most robust in this roundup, and it is certainly the easiest to use of these full-featured products.

M.Y.O.B. was our Editors' Choice when we reviewed low-cost accounting software in our issue of May 12, 1992, but its interface hasn't quite kept up with some of the newer products. Version 4.0, planned for release early in 1994, will include batch to-do list processing, recurring sales and purchases, and integrated Payroll with an intelligent tax engine. You tell Payroll where you work and where you live, and the program will automatically indicate which taxes apply. Furthermore, payroll will also support multiple pay types and customizable paycheck forms.

SUITABILITY TO TASK

M.Y.O.B.

	POWER	EASE
General accounting	Good	Good
Managing cash	Good	Good
Managing inventory	Good	Good
Managing information	Good	Excellent

SECTIONAL SETUP

M.Y.O.B.'s core accounting modules are G/L, Payables, Receivables, Checkbook, and Inventory. The Set-Up screen displays the tasks to get you started; to work on a task, you click on the zoom arrow next to it. When you're done, the task is marked as completed. M.Y.O.B. also provides five sample charts of accounts and a handy albeit brief Introduction to Accounting chapter in the manual. No tutorial is provided (although one is planned for Version 4.0).

Teleware provides unlimited phone support via a toll number for $79 per year. For an additional $20, you can receive any new upgrades that are released during the year. M.Y.O.B. does not come in a multiuser version, but you can assign passwords to the screen level or you can simply create a master password at log-on.

ACCOUNTS AND ANALYSIS

M.Y.O.B.'s account structure is *x-xxxx*, where the first digit represents the account type (for example, 1 = asset, 2 = liability) and the last four represent the standard account. You can designate accounts as detail-posting accounts or summary accounts, so you have the flexibility to print detailed or summary financial reports. A budget can be maintained for each detailed account by period, and transaction detail is kept online for the current year.

Drill-down capabilities, pioneered by Version 2.0 of the package, remain one of M.Y.O.B.'s most useful features by making in-depth inquiries truly easy. If you want to determine why marketing expenses were high for a given month, for example, you display the account information screen for the marketing expense account, click on the zoom arrow to display the journal entries that make up that balance, and click on a specific journal entry to display the original transaction, no matter where it originated. Drill-down is found throughout M.Y.O.B.

CHECKS AND BALANCES

Check writing is done through the Payables module for invoiced bills or through the Checkbook module for non-invoiced bills such as rent. A basic bank reconciliation function lets you track cleared checks and deposits, but you cannot enter bank charges.

As with all M.Y.O.B. forms, you can customize the check with an easy-to-use WYSIWYG formatter. The formatter lets you click and drag fields around the screen, change font types and sizes, and even copy in your company logo.

M.Y.O.B.'s Payables and Receivables sections suffice for small businesses. You can create sales invoices for items or services sold, and a new back-order feature tracks oversold items. You can assign a salesperson to the invoice, and although M.Y.O.B. doesn't calculate commissions, you can print a detailed sales-history report by salesperson, which you can use to calculate

1990, 1991 and 1992 World Class Awards for Best Mail-Order Company

All software is not copy-protected, unless indicated otherwise by *(CP)*.

The four- or five-digit number next to each product is the product's ITEM NUMBER. Please refer to this number when ordering. Thank you.

We carry only the latest versions of products. Version numbers are current at press time. Products listed here in red are Microsoft Windows Applications.

COMPUTERS

Compaq Computer ... 3 years
9031 ProLinea 4/33S Local Bus, 120 MB, Win. $1099.95
8984 ProLinea 4/33S Local Bus, 240 MB, Windows 1249.95
10894 ProLinea 4/50 Local Bus, 240 MB, Windows, PFS: WindowWorks, fax modem ... 1759.95
13553 Concerto 4/25 with pen, 250 MB, Windows for Pen Computing ... 2649.95
11420 Contura 4/25 with 209 MB, Windows ... 2199.95
11417 Contura 4/25C with 209 MB, Windows ... 2879.95
11646 DESKPRO 4/66M with 510 MB, Windows .. 3599.95
2016 LTE Lite 4/25 with 120 MB, Windows ... 2049.95
3029 LTE Lite 4/25E with 209 MB, Windows ... 3099.95

NEC
13347 Ready 425es Local Bus, 170 MB, Windows .. 999.95
13346 Ready 433es Local Bus, 210 MB, Windows 1229.95
13345 Ready 466es Local Bus, 250 MB, Windows 1729.95
Monitors not included with Systems.

Texas Instruments
13312 TM4000E WinDX 2/50 Mono w/200 MB ... 2739.95
6441 TM 4000E WinDX2/50 Active Matrix 200 MB 3799.95
8934 TM 4000E WinSX/25 Notebook with 120 MB 1899.95
4696 TM 4000E WinSX/25 Passive Color 120 MB 2149.95

Toshiba
13954 T1950CS Passive Color 120 MB ... 2499.
13953 T1950CS Passive Color 200 MB ... 2699.
13952 T1950CT Active Matrix with 340 MB ... 3399.

BUSINESS APPLICATIONS

3-D Visions
8883 Stanford Chart for Windows ... 58.95

Borland International
6788 Quattro Pro 5.0 for Windows *(3½" only)* ... 44.95
10710 Paradox 4.5 for Windows *(3½" only)* ... 145.95
11915 Borland Office for Windows 1.5 *(3½" only)* ... 239.95

Caere
4277 OmniScan 289.95 8933 OmniPage Pro 2.1 489.95

ChipSoft
6798 DOS Headstart State Pkg. 24.95 8415 Win 24.95
1663 TurboTax 1040 DOS *(Headstart Edition)* ... 39.95
3517 TurboTax 1040 for Win *(Headstart Edition)* . 39.95
6221 Turbo Tax/Quicken DOS Bundle ... 54.95
3080 Turbo Tax/Quicken Windows Bundle ... 54.95

Claris Corporation
6022 ClarisWorks for Windows with Quicken Bundle 119.95
5257 FileMaker Pro Win. 119.95 5228 Comp Upgrd 95.95

Intuit
2426 Quicken 7.0 $39.95 5596 3.0 for Windows $39.95

LaserTools
6882 PrintCache 3.1 ... 59.95

Lotus
10108 SmartSuite 2.1 ... 439. 6233 Upgrade ... 289
2756 1-2-3 4.0 for Windows *(2755 5¼")* ... 299
3428 1-2-3 4.0 for Windows Upgrade *(3424 5¼")* ... 95.
13578 Ami Pro with Quicken Bundle ... 249
13577 Ami Pro with Quicken Competitive Upgrade ... 109
5005 Freelance Graphics 2.0 for Win. *(3523 5¼")* ... 335

MECA
2798 Managing Your Money 10.0 ... 34.95
4603 TaxCut for DOS *(Headstart Edition)* ... 12.95
3885 TaxCut for Windows *(Headstart Edition)* ... 12.95
11124 TaxCut State Packages *(Headstart)* ... *ea.* 29.95

Microsoft
11325 MS-DOS 6.2 Upgrd. *(3½")* *while supplies last* 47.95
7009 Windows 3.11 *(7010 5¼")* ... 95.95
12707 Windows NT *(3½" & CD included)* ... 299.95
7811 Word for Windows 6.0 ... 299.95
2931 Access for Windows 1.1 *(2932 5¼")* ... 299.95
8138 Office 4.0 for Windows *(8137 5¼")* ... 479.95

MicroTac Software
13380 Spanish Assistant Win. 54.95 13377 Italian . 54.95
13379 French Assistant Win . 54.95 13378 German 54.95

Peachtree
12287 Accounting for Windows Release 2 ... 115.95

Polaris Software
4395 PackRat 5.0 ... 179.95

Software Marketing
5145 BodyWorks 3.0 39.95 12714 PharmAssist Win. 39.95

Software Publishing
4402 Harvard Graphics 2.0 for Win. *(4403 5¼")* ... 269.95

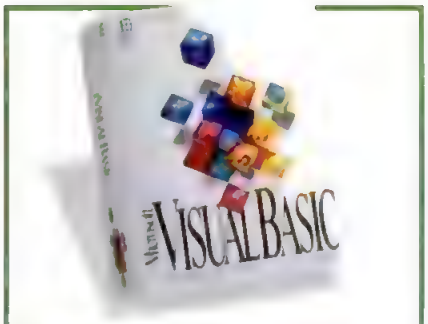
Toshiba
13954 *T1950CS Color Notebook w/120 MB*—i486DX2 40MHz, 9.5" dual scan Dynamic STN Color LCD VGA display, 4 MB RAM (upgrad. to 20 MB), Ballpoint Mouse **$2499.**
13953 *T1950CS with 200 MB* ... **2699.**

Symantec
1625 ACT! DOS 2.11 259.95 7435 Windows 1.03 259.95

WordPerfect Corporation
3445 Presentations 2.0 Win 299.95 7582 DOS 279.95
3795 WordPerfect 6.0 DOS 279.95 6274 Ver. Upgrd. 99.95
12914 WordPerfect Win. 299.95 12963 Ver. Upgrd. 99.95

GRAPHICS & DESIGN

Abracadata, Ltd.
13046 Design Your Own Home -Architecture Windows 31.95



Microsoft
10154 *Visual Basic for Windows Standard Ed.*—Fast object oriented programming language & access to data make this the most productive way to go from idea to application **$129.95**
10437 *Visual Basic 3.0 Pro. Edition* .. **319.95**

Adobe Systems
10774 Adobe Photoshop. 548.95 6439 Illustrator .. 429.95
5475 Adobe Illustrator & Photoshop Bundle ... 599.95

Aldus
1085 FreeHand for Windows *(3½" only)* ... 395.95
11667 PageMaker 5.0 Win. 579.95 6678 Upgrade 139.95

Altsys Corporation
12551 Fontographer & Typestry Bundle 279.95

Ares Software
8582 Font Workshop 149.95 8584 Font Chameleon 179.95

Corel Systems
11896 CorelDRAW! 4.0 .. 389.95 7923 Upgrade . 225.95

DeltaPoint
3435 Graphics Tools! 1.0 for Windows *(3½" only)* .. 99.95

Fractal Design
4356 Painter 2.0 ... 259.95 13218 PainterX2 ... 93.95

HSC Software ... 30 day MBG
12867 Digital Morph 1.0 *(3½" only)* ... 67.95

Micrografx
3628 Windows Draw! 3.0 *(3627 5¼")* ... 49.95

Microsoft
10051 Font Pack 2Win. 45.95 6103 Arcade 1.0 ... 27.95

North Coast Software
6992 PhotoMorph 1.0 for Windows ... 89.95

Shapeware
5426 Visio 2.0 for Windows *(3½" only)* ... 119.95

T/Maker
4680 Incredible Image 2000 Win. 89.95 3148 DOS 89.95

SYSTEM UTILITIES & PROGRAMMING

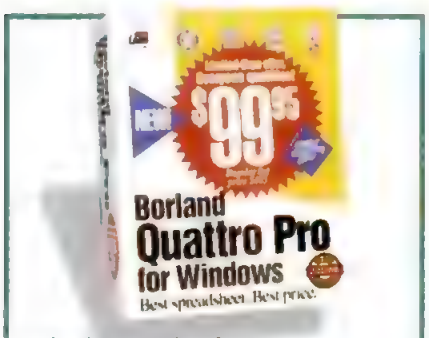
Avery Dennison
6006 Label Pro 1.65 *(Laser)* ... 45.95

Berkeley Systems
6642 Disney Collection Screen Saver *(3½" only)* ... 29.95
3528 After Dark 2.0 for DOS *(3½" only)* ... 29.95
12030 More After Dark (M.A.D.) for Win. *(3½" only)* .. 23.95
6649 Star Trek: The Screen Saver *(3½" only)* ... 29.95

Central Point Software
9555 Anti-Virus 2.0 *(9751 5¼")* or 8114 Backup 8.0 *ea.* 89.95
12833 PC Tools 9.0 .. 94.95 11395 for Windows ... 84.95

Claris Clear Choice
13219 Imaginana for Windows *(screen saver)* ... 34.95

Computer Associates
2970 CA-Clipper 5.2 for DOS ... 489.95



Borland International
6788 *Quattro Pro 5.0 for Windows (3½" only)*—A revolutionary spreadsheet for Windows. Features Spreadsheet Notebooks and Object Inspector to manage your spreadsheets quickly and effectively ... **$44.95**

Fractal Design
4356 *Painter 2.0 for Windows*—Turns your computer into an expressive fine-arts tool Texture, color, or Artists' Technique, this program accommodates your needs . . **$259.95**
13218 *PainterX2*—Expert extension **93.95**

Berkeley Systems
6642 *Disney Collection Screen Saver (3½" only)*—Over 15 colorful animated Disney displays with classic Disney voices & sounds **$29.95**
3528 *After Dark 2.0 DOS (3½" only)*—Invite flying toasters & more to your PC!.. **29.95**

Computer Associates
2970 *CA-Clipper 5.2 for DOS*—A robust language, efficient linker, flexible preprocessor & high-performance compiler. Incl. an editor, debugger and make utility for creating PC and LAN-based applications. **$489.95**

DataViz, Inc.
6508 Conversations Plus for Windows 1.0 *(3½" only)* 89.95
Delrina
9853 Opus 'n Bill Screen Saver ... 29.95
Hewlett-Packard
8731 Dashboard 2.0 for Windows ... 45.95
Micro Logic Corporation
6787 Info Select for DOS ... 87.95
12145 Info Select for Windows ... 87.95
Microsoft
10154 Visual Basic 3.0 Windows Std. Ed. *(3½" only)* 129.95
10437 Visual Basic 3.0 Windows Pro. Ed. *(3½" only)* 319.95
11444 Visual C++ Standard Edition *(3½" only)* ... 125.95
Pacific Microelectronics
13089 Mac-In-DOS for Windows ... 109.95
PC-Kwik
8004 PC-Kwik Power Pak 3.1 w/Power Disk *(4925 5¼")* 45.95
Qualitas
12541 386MAX 7.0 *(3½" only)* ... 49.95
Quarterdeck
3217 QEMM 7.0 *(3221 5¼")* ... 63.95
Stac Electronics
1409 Stacker 3.1 ... 95.95
Symantec
2360 The Norton Desktop 3.0 for Win. *(2359 5¼")* 115.95
5136 The Norton Utilities 7.0 *(3146 5¼")* ... 115.95
8535 pcANYWHERE DOS 119.95 11303 Windows 129.95
6250 Speedrive 4.0 *(3½" only)* ... 65.95
TouchStone Software
11665 CheckVit Pro: Set *(Volumes I & II included)* .. 79.95
XTree
8957 XTree 2.0 Win. 49.95 6161 XTree Gold 3.0 95.95

NETWORKING/COMMUNICATIONS

3 Com ... lifetime (conditional)
3453 EtherLink II/16.. 159.95 3469 II/16 TP ... 169.95
Asanté Technologies ... 5 years
2775 8 Port Hub 249.95 2772 12 Port Hub 499.95

Ares Software
8582 *Font Workshop Windows*—FontMonger, FontMinder, & FontFiddler bundled **$149.95**
8584 *FontChameleon Windows*—Synthetic font technology lets you build billions of fonts from one master font outline **179.95**

Artisoft
2234 Lantastic AE-2 EtherNet Starter Kit DOS 5.0 $459.95
2452 AE-2 EtherNet Adapter Card ... 199.95
BOCA Research ... 5 years
8397 M1440I FaxModem 119.95 8398 M1440E 149.95
CoActive Computing
1174 Connector DOS 134.95 1143 Connector Win. 134.95
1184 Coactive Connector Mac ... 29.95
Data Storm
4798 PROCOMM PLUS 2.01 69.95 2006 Windows 95.95
DCA/Crosstalk
5611 Crosstalk 2.0 for Windows ... 119.95
Delrina Technology
2446 WinFax PRO 3.0 79.95 5974 DOSFax PRO 49.95
Hayes ... 2 years
11396 ACCURA 144 + FAX 144 *(external)* ... 229.95
11397 ACCURA 144 + FAX 144 *(internal)* ... 199.95
7395 OPTIMA 144 + FAX 144 389.95 8167 PCMCIA 389.95
Hilgraeve
12081 HyperAccess Win.... 109.95 8204 DOS 59.95
IBM
13207 Internal Fax/Modem *(P/N MOD531)* ... 49.95
Intel ... 3 years
2994 EtherExpress 16 or 3021 16 TP ... *ea.* 99.95
1531 FaxModem 14.4/14.4 *(int.)* 159.95 1536 *(ext.)* 179.95
5994 SatisFAXtion Modem/400 ... 285.95
12934 14.4 PCMCIA FaxModem ... 299.95
8903 2400 bps Wireless Modem *(for cc:Mail)* ... 649.95
Megahertz ... 5 years
10515 C5144 14.4 Fax/Modem *(Compaq LTE/Contura)* 419.95
12763 XJ1144 14400 Fax/Modem *(PCMCIA)* ... 319.95
Microcom
6234 CarbonCopy Plus 6.1 129.95 4410 Windows 129.95

ChipSoft
3517 *TurboTax 1040 Win.*—Easy, fast, accurate. Features EasyStep & includes over 90 forms, schedules, & worksheets, IRS instructions, tax help, & itemizations..... **$39.95**
1663 *TurboTax 1040 for DOS* **39.95**

Microsoft
5743 Windows for Workgroups *(6207 5¼")* ... 159.95
Novell
12058 NetWare 4.0 *(10 user)* ... 1899.95
12056 NetWare 4.0 *(25 user)* ... 2799.95
Practical Peripherals ... lifetime
10570 PM14400FX MT ... 215.95
9234 PM14400FXPPM Pocket Fax/Modem ... 359.95
6123 PractiCARD 144 (PCMCIA card) ... 389.95
Shiva
NetModem/E for Win. for Workgroups.. *ea.* 1479.95
Selectec
13083 AirLan Bridge ... 344.95
Starter Kit *(ISA or MCA)* ... *ea.* 1369.95
Supra ... 5 years
5252 SupraFaxModem 144LC ... 149.95
11441 SupraFaxModem V.32bis External ... 209.95
Technology Concepts ... 2 years
6315 Fax Line Manager 203 ... 124.95
Traveling Software
4407 LapLink V ... 99.95
U.S. Robotics
11923 Sportster 14.4 FaxModem Internal ... 159.95
11924 Sportster 14.4 FaxModem External ... 184.95

800-800-0004

PC Connection **194PCM**
6 Mill Street
Marlow, NH 03456
SALES 603-446-0004 **FAX** 603-446-7791

Texas Instruments
6441 *TravelMate 4000E WinDX2/50 Active Matrix Color Notebook*—6.3 pounds, 200 MB, 16 ms IDE Hard Drive, 8.4" Active Matrix Color Display, 4 MB RAM (upgradeable to 20 MB), 1.44 MB Floppy, Trackball **$3799.95**

6631 WorldPort 14.4 PMCIA FaxModem ... 319.95
11922 WorldPort 14.4 Pocket FaxModem ... 329.95
Zoom Telephonics ... 7 years
3386 FaxModem AFC 24/96/48 *(internal)* ... 49.95
9519 FaxModem VFP 24K *(internal)* ... 175.95
9522 FaxModem VFX 24K *(external)* ... 199.95
13172 VFP V.32bis with CoSession Remote ... 134.95
13171 VFX V.32bis with CoSession Remote ... 169.95

VIDEO & SOUND

Adobe Systems ... 120 day MBG
12891 Premiere 1.0 for Windows *(3½" only)* 179.95
Aristosoft, Inc.
6780 Wired for Sound Pro 2.0 ... 39.95
ATI Technologies ... 5 years
12296 Stereo FX-CD 114.95 12720 VGA Wonder GT 174.95
3886 Graphics Ultra + 2 MB 249.95 3871 Pro 2 MB 369.95
11022 Graphics Ultra Pro EISA *(with 2 MB)* ... 399.95
Claris Clear Choice
13907 Alice to Ocean *(Book & CD)* ... 46.95
Creative Labs ... 1 year
5770 Sound Blaster 16 MCA ASP ... 209.95
Diamond Computer ... 5 years
1569 Stealth 24 VLB.. 159.95 1585 Viper VLB .. 414.95
Hauppauge
10593 Win/TV with Microsoft Video for Windows ... 419.95
IBM
13199 16 bit Audio Card *(P/N AC 523)* ... 169.95
Intel ... 3 years
11587 Smart Video Recorder ... 499.95
KOSS Corporation ... lifetime
11323 HD-4 speakers 54.95 11700 HD-6 speakers 79.95
Logitech ... 2 years
12421 AudioMan .. 89.95 11462 SoundMan 16.... 109.95
Media Vision ... 3 years
5637 ProAudio Spectrum 16 169.95 12028 Studio 219.95
NEC ... 2 years
11949 MultiSync 3FGE... 629.95 11948 4FGE... 749.95

CoActive Computing
1143 *CoActive Connector for Windows*—Connect PCs or Macs in 5 min., guaranteed. Plugs in parallel port for file & printer sharing with up to 32 sys. Incl. hardware, software, & cable **$134.95**
1174 *for DOS* **134.95** 1184 *for Mac* **29.95**

PC CONNECTION®

© COPYRIGHT PC CONNECTION, INC., 1993. PC CONNECTION, PCTV AND THE RACCOON CHARACTER(S) ARE REGISTERED TRADEMARKS OF PC CONNECTION, INC., MARLOW, NH. ALL OTHER TRADEMARKS REMAIN THE PROPERTY OF THEIR RESPECTIVE COMPANIES.

Qualitas
12541 *386MAX 7.0 (3½" only)*—New 386MAX version 7 makes DOS under Windows better than DOS itself. Get more conventional memory, a comprehensive memory tester and special support for DOS 6 ..... **$47.95**

Sony ... 1 year
6803 CDU-31A-02 Internal CD-ROM Drive 159.95
10530 CPD-1430 14" Multiscan Trinitron Display..... 689.95
6802 Interface Kit *(OPA-4741)*..... 54.95

INPUT/OUTPUT

Caere ... 1 year
4277 OmniScan *(with OmniPage Direct)*..... 289.95
Canon ... 1 year
7809 BJ-200 BubbleJet Printer 315.95
9614 BJC-600 Color Inkjet 599.95
CoStar ... 1 year
1814 LabelWriter II Plus..... 239.95
Epson ... 2 years
11800 LQ570+ *(80 col., 269 cps)*..... 269.95
10784 Action Laser 1500 *(2 MB)* 699.95
13110 Action Scanning System 849.95
Hewlett-Packard ... 1 year
6442 LaserJet 4 *(with toner)* 1479.95 12212 4L 699.95
7620 DeskJet 550C 629.95 13682 LasrJet 4P 1059.95
IBM
13210 Joystick *(P/N JOY 575)*..... 19.95
13485 Professional Keyboard *(P/N KB571)*..... 89.95
Kensington Microware ... 1 year
7899 Expert Mouse 4.0 *(Serial)* 99.95 7900 *(Bus)* 114.95
Kraft ... 5 years
8346 Thunderstick with JetFighter 2 ..... 39.95
Logitech ... limited lifetime
3996 Trackman2 *(combo)* 79.95 2343 Portable .. 99.95
3295 Mouseman *(combo)* 59.95 9766 *(cordless)* 89.95
2468 ScanMan256 with OminiPage Direct 199.95
7463 ScanMan Easy Touch for Windows 229.95
13934 Cyberman 3D Controller 79.95
Microsoft ... lifetime
7597 Microsoft Serial Mouse 69.95 2898 with Win 145.95
1896 Ballpoint Mouse..... 79.95
MicroSpeed ... 1 year
6007 PC-TRAC Trackball..... 59.95
Microtek ... 1 year
13362 SCANDEX..... 279.95 13361 Scooter 419.95
5187 ScanMaker II 879.95 5175 ScanMaker IIxe 1099.95
13359 ScanMaker IIG.... 489.95 13360 IISP 749.95
Mouse Systems ... lifetime
7878 PC Mouse III *(serial)*.. 69.95 9082 Mouse I.. 19.95

3-D Visions
8883 *Stanford Chart Win.*—Provides over 165 2-D and 3-D graph types for business, statistical, and technical users, plus a sophisticated built-in spreadsheet and floating assortment of drawing and annotation tools .. **$58.95**

Mustek ... 1 year
8452 Gray Artist for Win. *(256 GS hand scanner)* $165.95
Okidata ... 1 year
6174 OL400E Laser Printer 549.95
Pacific Data
13040 ProTracer II 1399.95 13041 with HP-GL 1849.95
Seiko ... 1 year
1069 Smart Label Printer Plus *(Windows or DOS)* 145.95

ACCESSORIES

American Power ... 2 years
3819 Back-UPS 250 115.95 3858 Back-UPS 400 179.95
7107 Back-UPS 450 215.95 7105 Smart-UPS 600 439.95
Curtis ... lifetime
7654 Command Center Plus 78.95
Cyrix
10538 486 DRX2 25/50 Microprocessor Upgrade .. 339.95
Intel ... lifetime
4750 80387SX..... 79.95 5409 80387DX 85.95
6418 Intel 486 DX2 OverDrive Processor 486SX-25 369.95
Kensington Microware ... 1 year
Full line available. Partial listing.
7060 MicroSaver Security System 38.95
PC Power & Cooling ... 2 years
9537 CPU Cooler *(for 386/33 up to 486)* 29.95
3203 Turbo Cool 200 149.95 7915 Turbo Cool 300 159.95
Targus ... lifetime
7369 Notepac..... 35.95 1305 Universal..... 69.95
Tripp Lite ... 2 years
6199 Isobar 4-6..... 43.95 6200 Isobar 6-6 ..... 49.95
5550 BC250 Battery Backup 119.95 9312 BC500 219.95

DRIVES

Colorado Memory Systems ... 1 year
4354 Jumbo 250 Tape Backup 179.95
1073 Trakker 250 Tape Backup *(parallel)*..... 349.95

ON CD-ROM

DeltaPoint
9435 *Graphics Tools! 1.0 Windows (3½" only)*—Organize your graphics in a drag and drop thumbnail viewer, convert files, autotrace, image editing, painting, screen capture, 700 pieces of clip art & dozens of photos **$99.95**

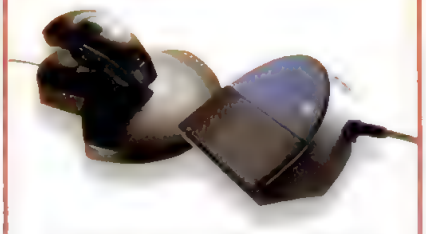
Conner Peripherals ... 1 year
2339 CP30104H 120 MB IDE HD *(19 ms)*..... 199.95
1337 CP30204 210 MB IDE HD *(16 ms)* 256.95
13503 CP30540 540 MB SCSI Drive 699.95
Iomega ... 1 year
10452 Transportable MultiDisk 150 ..... 559.95
6344 PC Powered 90 PRO 489.95 10537 150 479.95
2530 90 MB Cartridge... 100.95 2467 Tripak... 289.95
8481 Tape250 Insider Half-Height Tape Backup.. 209.95
MDS Removable Hard Drives
11851 MDS 105 MB 3.5" Internal Removable IDE . 429.95
NEC ... 2 years
13339 CDR-400 MultiSpin 3Xp 13341 CDR-500 3Xi *ea.* 499.95
13340 CDR-600 MultiSpin 3Xe 599.95
TEAC ... 1 year
6951 1.2 MB Drive for AT 55.95 7371 1.44 MB Drive 45.95
4414 3.5"/5.25" Dual Floppy Drive 145.95

MEMORY

1411 1 MB x 9 SIMMs *(70 nanosecond)* ..... call
3702 4 MB x 9 SIMMs *(60 ns)* 2497 4 MB x 9 *(80 ns)* call
5746 1 MB Chips *(80 nanosecond, set of 9)* ..... call

DISKS/MEDIA

Fuji ... lifetime
2215 3.5" HD Disks *(10)*.... 11.95 2241 *(50)*.... 49.95
5692 3.5" HD Preformatted Disks *(20)* w/storage case 24.95
Kao
11870 3.5" HD Disks *(10)*.... 10.95 11869 *(30)*.... 31.95
Sony ... 1 year
6375 3.5" HD Disks *(30)*.... 32.95 11871 *(100)*..... 89.95
1603 DG60M *(2 yr.)* 11.95 2520 DG90M *(2 yr.)* 14.95
3M ... lifetime
1581 DC2120 Cartridge 18.95 11013 *(3 pack)* 49.95



Includes OmniPage Direct

Logitech ... limited lifetime
13934 *CyberMan 3D Controller*—Input device for games that lets you move freely in 3 dimensions **$79.95**
7463 *ScanMan EasyTouch Windows*—Personal scanner with 256 gray-scale..... **229.95**

OUR POLICY

- We accept VISA and MASTERCARD.
- No surcharge added for credit card orders.
- Your card is not charged until we ship.
- If we must ship a partial order, we never charge freight on the shipment(s) that complete the order (in the U.S.).
- No sales tax, except Ohio residents (please add applicable tax).
- All U.S. shipments insured; no additional charge.
- APO/FPO orders shipped 1st Class Mail.
- International orders: U.S. $100 minimum, add 2% surcharge and $2.30 insurance. Manufacturer support and upgrade eligibility may be limited outside the U.S.A. Some products not available for export, call or fax information.
- Upon receipt and approval, personal and company checks clear the same day for immediate shipment of your order.
- Corporate P.O.s accepted subject to approval.
- COD max. $1000. Cash or cashier's check. COD orders require an additional $4.50 charge. COD orders ship via UPS and may require additional UPS charges.
- 120 day limited warranty on all products. Defective software replaced immediately. Defective hardware repaired or replaced at our discretion. All items subject to availability. Prices and promotions subject to change without notice (e.g. SIMMs).
- We are not responsible for typographical errors.
- Order lines opened continuously from 8 a.m. Monday until 5 p.m. Sunday ET. Business offices at 603-446-3383 Monday through Friday 9 a.m. to 5:30 p.m. ET.

SHIPPING

Continental U.S.: The total freight charge on any order placed with PC Connection is only $5. Barring events beyond our control, all credit card orders (no COD orders) phoned in weekdays by 3 a.m. ET will ship Airborne Express for delivery the next business day. Which means *same day* delivery for orders placed between midnight and 3 a.m. ET. (Some orders may ship by UPS Ground for next day delivery). Saturday delivery available to many areas upon request at no additional charge. Order all day Saturday through noon on Sunday for Monday delivery. (Some areas require an additional day delivery).
Hawaii, Alaska, Canada, Puerto Rico and the U.S. Virgin Islands: Shipping to these areas may require additional time and charges. Call 800-800-0004 for information.
All other areas: Please call 603-446-0004 or FAX 603-446-7791 for information.

MicroTac Software
13380 *Spanish Assistant for Windows*—Gives you fast, understandable translations to or from Spanish. Incl. powerful reference tools **$54.95**
13379 *French Assistant for Windows*..... **54.95**
13378 *German* **54.95** 13377 *Italian* **54.95**

PC CONNECTION

YOUR SOURCE FOR SYSTEMS, SOFTWARE AND PERIPHERALS

We carry over 3500 products! Call for our latest catalog!

SMART

SUITE UPGRADE INCLUDES IMPROV BONUS

$289

ACTIVE

COLOR MATRIX DISPLAY FROM TI

$3799.95

TURBO

SHOW THE IRS YOU MEAN BUSINESS

$34.95* *With $5 rebate coupon!*

WIRED (NOT!)

NEW WIRELESS MODEMS FROM INTEL

$649.95

800-800-0004

COPYRIGHT 1993 PC CONNECTION, INC. PC CONNECTION, EVERYTHING OVERNIGHT, PCTV, AND THE RACCOON CHARACTER(S) ARE REGISTERED TRADEMARKS AND ONE-MINUTE MAIL ORDER IS A TRADEMARK OF PC CONNECTION, INC., MARLOW, NH.

SUMMARY OF FEATURES

Products listed in alphabetical order ■ = YES □ = NO	BestBooks	CashBIZ	CA-Simply Accounting for Windows	Do-It-Yourself Accounting	PC MAGAZINE EDITORS' CHOICE Microsoft Profit	M.Y.O.B.	PC MAGAZINE EDITORS' CHOICE Peachtree Accounting for Windows
General Ledger Module (continued)							
Predefined G/L reports:							
Balance sheets/Income statements	■■	■■	■■	■■	■■	■■	■■
Cash-flow statements (FASB 95)	■	■	□	□	■	■	■
Trial balance	■	□	■	■	■	■	■
Chart of accounts	■	■	■	■	■	■	■
Comparative-year financial statements	■	□	□	□	■	■	■
Budget-vs.-actual financial statements	■	■	□	■	■	■	■
G/L custom report writer	□	□	□	□	□	□	■
Purchasing/Accounts Payable Module							
Maximum number of bank accounts supported	Unlimited	Unlimited	2	Unlimited	10	Unlimited	Unlimited
Checks history for duplicate invoice number	□	■	■	□	■	□	□
Permits user to add vendors on the fly	■	■	■	■	■	■	■
Processes void checks	■	■	□	□	■	■	■
Issues debit memos	■	□	□	□	□	■	■
Allocates vouchers to multiple accounts	■	■	■	■	■	■	■
Payment terms stored by vendor	■	□	□	□	■	■	■
Permits one-time vendors	□	□	■	□	■	■	■
Permits recurring vouchers	■	■	□	□	■	□	■
Manual check processing	■	■	■	■	■	■	■
Allows payment selection by:							
Vendor number and name	■	■	■	■	■	■	■
Due date	□	□	□	□	□	□	■
Discount date	□	□	□	□	□	□	■
Reconciles checks against bank statement	■	■	□	■	■	■	■
Lists outstanding checks	□	□	□	■	■	■	■
A/P reports:							
Check preview	□	■	■	■	■	■	■
Check register	■	■	□	■	■	■	■
Cash projection by due dates	□	□	□	□	■	■	■
Prints 1099 forms	□	□	□	■	□	□	■
Invoicing/Accounts Receivable Module							
Number of ship-to locations per customer	1	1	1	1	1	1	1
Checks customer credit limit	■	□	■	□	■	■	■
Issues credit memos referenced to an invoice	■	■	□	□	■	■	■
Permits payments on account	■	■	■	■	■	■	■
Processes partial payments	■	■	■	■	■	■	■
Applies cash receipts to multiple invoices	■	■	■	■	■	■	■
Handles recurring billings	■	■	□	□	■	■	■
Calculates discount terms per customer	■	□	□	□	■	■	■
Calculates finance charges	■	□	■	□	■	■	■
Adds customers on the fly	■	■	■	■	■	■	■
Tracks salesperson at invoice level	■	□	□	□	■	■	■
A/R reports:							
Statements	■	■	■	■	■	■	■
Aging report in detail/summary	■■	■□	■■	■□	■■	■■	■■
Dunning letters	□	□	□	□	□	■	■
Customer mailing labels	■	■	■	■	■	■	■
Sales by salesperson	■	□	□	□	■	■	■
Price quotes	■	□	□	□	■	■	■
Sales tax report:							
Jurisdiction	□	□	□	□	□	□	■
Gross sales	■	□	□	□	□	■	■
Amount due	■	■	□	□	□	■	■

CONTINUES

	QuickBooks for Windows	Service Industry Accounting
	■■	■■
	■	■
	■	■
	■	■
	■	■
	■	■
	□	□
	10,000	Unlimited
	■	□
	■	■
	■	■
	□	■
	■	■
	■	■
	□	□
	■	■
	■	■
	□	□
	□	□
	□	□
	■	■
	■	■
	■	■
	■	■
	■	■
	□	■
	1	1
	■	■
	■	■
	■	■
	■	■
	■	■
	■	■
	■	■
	□	■
	■	■
	■	■
	■	■
	■	■
	■■	■■
	■	■
	■	■
	■	■
	□	■
	□	■
	■	■
	■	■

commissions off-line.

Ideally, M.Y.O.B. would allow multiple ship-to addresses for each customer and assign default tax rates to each ship-to location; without these features, tracking and reporting sales taxes can be cumbersome. M.Y.O.B. can help you with this to a point: It lets you assign sales tax to an invoice and print sales-tax reports by customer.

Establishing item prices is a snap using the Set Item Prices function. You can specify items to be sold at a certain percentage markup, margin, or gross profit. You can even specify that the selling price always end with any number—97 cents, for example. Item cost is based upon the average cost or last purchase price.

M.Y.O.B.'s contact manager tracks your conversations with customers or prospects. The simple screen captures the date, free-form notes, and a follow-up date. Any planned follow-ups are automatically added to your to-do list for the appropriate day.

INVOICING AND INVENTORY

Although M.Y.O.B. doesn't offer formal Order Entry or Purchase Order modules, it will let you enter inventory items for unposted invoices and will print Purchase Orders. Companies requiring anything more than these rudimentary functions, however, will want to look elsewhere.

M.Y.O.B. does a good job of supporting inventory management. As item quantities fall below the minimum stocking level, M.Y.O.B. creates a To-Do task notifying you that you need to create a purchase order. Clicking on the zoom arrow will take you to a nearly completed purchase-order screen—it doesn't get much easier than this!

A single-level Bill of Material is available for manufactured or assembled items. When you designate the quantities of the components that make up a finished good, M.Y.O.B. uses the Auto-Build feature to build automatically the specified quantity of the finished good, relieve the subcomponents, and update the costs.

REAMS OF REPORTS

M.Y.O.B. is loaded with standard reports; the A/R module alone has 23. Perhaps because of this, M.Y.O.B. does not provide any type of report writer. Certain data files can be imported from or exported to text files, but no direct spreadsheet integration is available. Charting capabilities would also improve M.Y.O.B.'s flexibility. Another general weakness is that M.Y.O.B. doesn't save your activity during a session until you either exit or do a manual File Save. This poses a genuine threat of data loss in the event of a power outage or an improper exit from Windows.

M.Y.O.B.'s innovative features, such as the To-Do List and drill-down inquiry, offer the small-business user a tool with which to manage business information, instead of just tracking debits and credits. If you don't need a multiuser system and also have limited sales-tax tracking needs, you'll want to consider M.Y.O.B.

▶FACT FILE

M.Y.O.B., Version 3.0
Teleware Inc., 300 Roundhill Dr., Rockaway, NJ 07866; 800-322-6962, 201-586-2200; fax, 201-586-8885.
Circle 465 on reader service card

Peachtree Software Inc.

Peachtree Accounting for Windows

BY KATHY YAKAL

In the enduring battle between power and ease of use in the small-business accounting software war, Peachtree Software has struck a surprising truce. Release 2.0 of Peachtree Accounting for Windows ($169) offers simple navigation and a host of other help features tailored to suit the beginning bookkeeper. At the same time, it boasts enough accounting acumen—and password levels—to please small businesses that need more horse-

SUITABILITY TO TASK

Peachtree Accounting for Windows

	POWER	EASE
General accounting	Excellent	Excellent
Managing cash	Excellent	Excellent
Managing inventory	Good	Excellent
Managing information	Good	Excellent

THERE'S A UNIQUE LINK

Austin 425-130

- 486SX-25 Processor
- 4 MB RAM
- 130 MB Hard Drive
- Monochrome Display

$1,599 Lease $60/month*

Austin 425C-130

- 486SX-25 Processor
- 4 MB RAM
- 130 MB Hard Drive
- Dual Scan Color Display

$2,199 Lease $82/month*

OUR CUSTOMERS HAVE AND JUST CAN'T GET

Austin has developed a unique philosophy regarding notebook computers that serves our customers well: You don't need to be rich to be powerful.

Our notebooks are a perfect demonstration. At price/performance levels known to drop jaws throughout the industry, these compact machines have everything except an inflated bottom line.

Consider: a 32-bit Local Bus Video with 1 MB VRAM and Windows™ Accelerator to send you speeding. Two Type II or one Type III PCMCIA slots for communications, storage, or multimedia options. Simultaneous CRT and LCD displays for impressive presentations to anyone,

PC MAGAZINE EDITORS' CHOICE · PC MAGAZINE READERS' CHOICE · MICROSOFT WINDOWS READY-TO-RUN · intel inside · yes NetWare Tested and Approved

BETWEEN MONEY & POWER:

Austin 466C-213

- 486DX2-66 Processor
- 8 MB RAM
- 213 MB Hard Drive
- Dual Scan Color Display

$2,999 Lease $112/month*

Austin 466T-340

- 486DX2-66 Processor
- 8 MB RAM
- 340 MB Hard Drive
- TFT Active-Matrix Color Display

$4,499 Lease $157/month*

LIMITED AMOUNTS OF ONE, ENOUGH OF THE OTHER.

anywhere. And a front-and-center 16 mm trackball that's easy to access, easy to use.

But there's more. To give you an even better run for your money, all notebook configurations are available with an optional 524 MB hard drive (the industry's largest), convenient docking station, and travel accessories.

If feeding your hunger for high performance leaves you feeling spent, call us toll-free today. Austin Computer Systems. Where the price of power is always low.

Call Direct 1-800-483-9938

Austin Computer Systems • An IPC Company • 10300 Metric Blvd., Austin, TX 78758
FAX: 512-454-1357 • Overseas: 512-339-3500 • Canada: 1-800-338-1565

AUSTIN
AN IPC COMPANY

©1994 Austin Computer Systems. All rights reserved. The Intel Inside logo is a registered trademark of Intel Corporation. Microsoft is a registered trademark and Windows and the Windows logo are trademarks of Microsoft Corp. All other company names and products are trademarks or registered trademarks of their respective owners. Prices and specifications are subject to change without notice. *Lease term reflects 36-month contract.

CIRCLE 156 ON READER SERVICE CARD

SUMMARY OF FEATURES

Products listed in alphabetical order ■ = YES □ = NO	BestBooks	CashBIZ	CA-Simply Accounting for Windows	Do-It-Yourself Accounting	Microsoft Profit (PC MAGAZINE)	M.Y.O.B.	Peachtree Accounting for Windows (PC MAGAZINE)
Inventory Module							
Inventory item-code structure (in alphanumeric characters)	14	N/A●	7	10	15	13	20
Maximum number of warehouses	1	N/A●	1	1	1	1	1
Data fields maintained							
Quantity on hand	□	N/A●	■	■	■	■	■
Quantity on order	□	N/A●	□	□	■	■	■
Committed quantity	□	N/A●	□	□	□	■	□
Inventory costing method	None	N/A●	Weighted average	Standard cost	Weighted average	Average cost	Weighted average
Pricing							
Maximum number of price levels by item	1	N/A●	1	1	1	1	1
Discount quantities by percentage	□	N/A●	□	□	□	■	□
User can sell noninventoried goods	■	N/A●	■	■	■	■	■
User can sell service items	■	N/A●	■	■	■	■	■

N/A● —Not applicable. The product does not have this feature

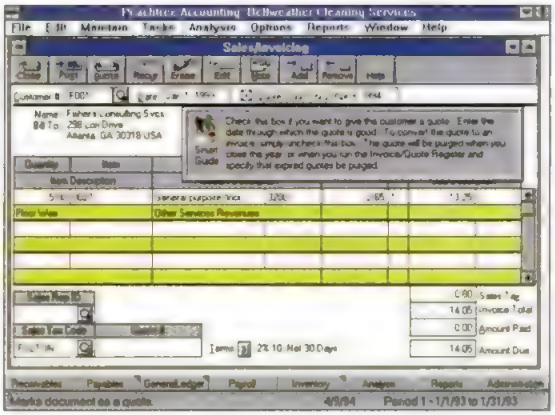
power and security than many low-end products provide.

SETTING UP

Peachtree has paid particularly close attention to one of the most critical—and often badly designed—elements of entry-level accounting software: setup. Experienced users can zip through setup and start working, while users with no background in setting up financial books, manually or automated, can follow the steps clearly outlined in the company's setup checklist.

Peachtree Accounting for Windows is one of the more powerful programs in this group in terms of sheer financial processing; it offers G/L, A/R, A/P, Payroll, Inventory, and a variety of tools for business analysis. You can choose from 12 charts of accounts, copying only the account names and numbers, or also the accounting periods, statement formats, A/R defaults, A/P defaults, and Payroll defaults. Every step of the way, on-screen SmartGuide text clarifies what you are being asked, and occasional warnings alert you to irreversible decisions—for instance, the setup of your accounting periods for the next two years. Once you have set up your company, you can start working right away; you don't need to establish all your customers or vendors first.

Supplementing the package's generous on-screen help, Peachtree provides a starter manual (separate from the excellent user manual) that walks you through the process of setting up and entering your first transactions. If you encounter problems not covered there, you can choose from two rather pricey support options: 75 minutes of phone support for $99, or a per-call charge ($25 minimum per call). The program lets you perform on-the-fly addition of accounts, customers, vendors, and employees, so you can skip a lot of the prescribed setup steps if you prefer and start entering transactions.



Peachtree's SmartGuides lead you through sophisticated, GAAP-compliant accounting procedures, letting you work quickly and easily.

AUTOMATED HELP

To assist you even further, SmartGuides follow you throughout the program, popping up on the screen whenever additional explanations may be required. This slows the program down a bit (it's a little slow already because it is so graphics-intensive), but you may save time because you won't need to use the on-line help as much. Experienced users can always turn SmartGuides off.

While you can use the program's standard pull-down menus to get around, Peachtree Accounting for Windows offers an optional navigational and learning aid. Click one of the file folder tabs running along the bottom of the screen—Payables, for instance—and up pops a col-

ENDS

PC MAGAZINE

	QuickBooks for Windows	Service Industry Accounting
	10	10
	1	1
	☐	■
	☐	■
	☐	■
	None	Weighted average
	1	3
	☐	■
	■	■
	■	■

orful flowchart illustrating the tasks that compose that section, with arrows indicating how each interacts with the others. Click on Payments (with arrows pointing to both Payments Journal and Check) and a blank check pops up.

Type a question mark or click on the lookup button in the Vendor box to select a vendor. If you have outstanding invoices with that vendor, this information will appear in a box at the bottom of the screen, and you can choose to apply your payment to that invoice or simply to expenses (or earmark it as a prepayment). After you've finished filling in the blanks, a toolbar at the top of the screen gives you a variety of choices, including posting the payment to the G/L module, printing a check, or setting this up as a recurring transaction. All transactions in Peachtree Accounting for Windows follow this pattern.

The Inventory module is probably its weakest. It uses the weighted average method of costing only and doesn't support multiple warehouses or automatically reorder out-of-stock items. Though there is no Order Entry module per se, invoices are recorded in the A/R module and inventory is "relieved" of ordered items.

FLEXIBLE BUSINESS ASSESSMENT

One of the package's greatest strengths is its underlying flexibility. For example, you can choose to pay bills by discount date, current or past due date, or designated "mask"—Peachtree's way of letting you set up account numbers so you can select groupings by department, division, or location. You can set up multiple levels of sales-tax tracking. The program's Custom Forms Designer, while requiring a bit of graphics design skill, lets you tailor existing forms or start from scratch to create quotes, purchase orders, checks, payroll tax forms, invoices, statements, and form letters—all in color and based on items Peachtree tracks.

Report parameters are generous, too. From the package's 75 standard reports, you can create unlimited customized variants by defining groups of accounts, customers, or vendors; dates; and a variety of other variables—more customization than is offered by most accounting programs for small businesses. Unfortunately, you can't name or save these reports, specify fonts or type sizes (except globally), or export directly in spreadsheet format; only ASCII export is supported.

Peachtree Accounting for Windows offers some special tools for gauging your financial health. The Cash Manager, Collections Manager, and Payments Manager provide quick graphical analysis of those three facets of your books. While the graphs in question are fairly simple, you can pull very specific information out of them. For example, zoom in on a particular aging bracket in the Collections Manager and you'll see a list of related accounts. Double-click on one or on the Detail icon to see a register of transactions overdue.

Peachtree Accounting for Windows has more power than some small businesses will need, and those extras, albeit easy to use, may be intimidating to the novice. But you would be hard-pressed to find another product in this group that so competently combines multiuser, by-the-book accounting procedures with simple operation.

SUITABILITY TO TASK

QuickBooks for Windows

	POWER	EASE
General accounting	Good	Excellent
Managing cash	Good	Excellent
Managing inventory	Poor	Excellent
Managing information	Good	Excellent

FACT FILE

EDITORS' CHOICE Peachtree Accounting for Windows, Release 2.0
Peachtree Software Inc., 1505-C Pavilion Pl., Norcross, GA 30093; 800-288-0068, 404-564-5800; fax, 404-564-5888.
Circle 466 on reader service card

Intuit Inc.

QuickBooks for Windows

BY KATHY YAKAL

With QuickBooks for Windows, Version 2.0, Intuit implements the idea that people piloting small businesses need an accounting package that's intuitive and unintimidating more than they need a strict audit trail. In fact, Intuit runs with this idea all the way to the goal line.

The $159 QuickBooks builds on the interface of Intuit's phenomenally successful personal-finance package, Quicken for DOS and Windows, and can import Quicken files in one simple step. The result is, hands down, the easiest to use accounting package in this roundup.

In its emphasis on usability, QuickBooks does omit some traditional accounting controls, such as audit trails, reversing entries, and period closes. Also, it won't process 1099 forms or calculate finance charges. Some customers will doubtless shun the product for these reasons. Nevertheless, QuickBooks' potential audience seems vast.

While QuickBooks generates invoices and offers limited Payroll processing, it doesn't include traditional modules for Inventory, Order Entry, or Payroll. But the basic financial accounting it does provide—G/L, A/R, A/P, invoicing and bill-paying, account tracking and reconciliation, and generous reporting—will be more than sufficient for many small businesses.

SETUP AND INTERFACE

QuickBooks has arguably the most intuitive user interface of any program of comparable power, and setting up the

"16-Bit Sound Explosion!"

Everything is Crystal Clear!

Earth shaking, bone rattling, crystal cracking 16-bit, 44.1 KHz stereo audio. From sonic booms as you devour Mach 1, to the hottest guitar licks that rock the house, Aztech Labs delivers, and delivers BIG! The Sound Galaxy NX Pro 16 audio card leads the multimedia revolution with the widest sound standard compatibility in the market today. Bundled with the finest multimedia and business audio software, headphones, and a microphone, buy Sound Galaxy, and get the most flexible, compatible, and affordable sound performance available for your PC!

The Compatibility Advantage!

Aztech's Sound Galaxy NX Pro 16 audio card owns the compatibility advantage. Only Sound Galaxy is compatible with Microsoft Windows Sound System, Sound Blaster PRO, AdLib, Covox Speech Thing and Disney Sound Source. And only Sound Galaxy gives you the widest choice of CD-ROM interfaces, and a SCSI and Wave-Table Synthesis upgrade. Aztech products give you greater software and CD-ROM drive compatibility than either Creative Labs or Media Vision! Aztech Labs opens your window to the multimedia revolution like no one else can!

Look for the Sound Galaxy NX Pro 16 audio card at your local dealer today!

Your Multimedia Leader!

With over 700,000 boards shipped, a strong commitment to R & D, and a host of exciting products scheduled for release, Aztech Labs leads the Multimedia industry into the future. Sound Galaxy's Wave-Power Digital Wave-Table Synthesizer and new Double Speed CD-ROM Multimedia Upgrade Kit are a glimpse of the future available now.

Get the Sound Galaxy NX Pro 16 from Aztech Labs, the difference is crystal clear! Visit your local computer dealer & insist on Sound Galaxy!

For information call 800-886-8859 today.

SOUND GALAXY NX PRO 16 OUTPERFORMS THE COMPETITION: EASILY!	SOUND GALAXY NX PRO 16	SOUND BLASTER 16 ASP	MEDIA VISION PRO AUDIO SPECTRUM 16
COMPATIBLE WITH:			
SOUND BLASTER	YES	YES	YES
SOUND BLASTER PRO	YES	NO	NO
MICROSOFT WINDOWS SOUND SYSTEM	YES	NO	NO
COVOX SPEECH THING	YES	NO	NO
DISNEY SOUND SOURCE	YES	NO	NO
ADLIB	YES	YES	YES
MULTIPLE CD-ROM INTERFACES (AT-BUS)			
PANASONIC	YES	YES	NO
MITSUMI	YES	NO	NO
SONY* (adapter required)	YES	NO	NO
CD-ROM INTERFACE (SCSI)	OPTION TO UPGRADE!	NO	YES
OPTION FOR UPGRADE TO 16-BIT WAVE-TABLE SYNTHESIS	YES	YES	NO!

WinBIC TOP PRODUKT

TOP PRODUCT AWARD BY WINDOS MAGAZINE (GERMANY)

SOUND GALAXY

"Pioneering the Multimedia Explosion!"

A product of Aztech Labs, Inc.

MICROSOFT® WINDOWS™ COMPATIBLE

MPC Multimedia PC

AZTECH

46707 Fremont Blvd., Fremont, CA 94538. U.S.A. Tel: (510) 623-8988 Fax: (510) 623-8989

© 1993 Aztech Labs, Inc. Aztech, the Aztech logo, and Sound Galaxy are trademarks or registered trademarks of Aztech Labs, Inc.
All other names are trademarks or registered trademarks of their respective holders. Specifications, terms, and services subject to changes without notice.

CIRCLE 318 ON READER SERVICE CARD

package is a no-brainer: Simply fill in your company name and address, along with the first month of the fiscal year; select from QuickBooks' three invoice formats; indicate whether you charge sales tax; choose 1 of 20 predefined charts of income and expense accounts; and establish password security if you want to. That's all you need to do.

At this point you can either start setting up accounts or jump right in and enter transactions. You might want to use one or all of the QuickTour tutorials first, but context-sensitive help and QCards (a style of balloon help pioneered by Intuit) are available within the program, and telephone technical support is free.

In addition to its standard pull-down menu system, QuickBooks offers a toolbar containing icons for its 14 most commonly accessed functions.

QuickBooks offers a toolbar containing dedicated icons for its 14 most commonly accessed functions.

NO-SWEAT NAVIGATION

Navigation also follows standard Microsoft Windows conventions, but QuickBooks adds its own brand of mouse-driven time-savers. To write a check, for example, click on the Check icon, then click the arrow to pull up the account list and select the appropriate account. If the check is to an existing payee, you can either click on the browse button and select the name or start typing; QuickBooks' QuickFill feature will complete the payee's name.

For unrecognized names, QuickBooks pops up a dialog box that lets you add new payees on the fly; a QuickAdd option lets you enter just the name and return later to fill in the details. The date and check number are filled in automatically (though these can be overridden). You can use pop-up lists to assign an expense account and a job and class, then click on the appropriate box to print the check now or later. Click, click, click.

REPORTING

QuickBooks offers over 50 standard reports, ranging from Profit and Loss, Balance Sheet, and typical A/R and A/P reports to budget and transaction reports. All reports can be extensively customized: For example, you can filter by variables like Name, Amount, or Customer Type; customize columns, choosing from elements like Previous Period, Previous Year, and Percentage Change; specify formatting options for number display; and stylize headers and footers, to name just a few options. You can save customized reports.

Following the lead of the Quicken products, QuickBooks provides graphical views of six of the most important finan-

GUESS WHO JUST INSTALLED A BUFFALO COMPUTER UPGRADE.

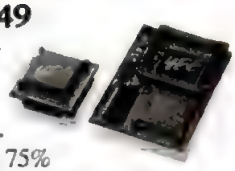
PRINTING SHARING POWER

Need to share printers or need to speed up network printing? Try one of the intelligent and reliable buffered sharing devices from $349. Even share minis, PCs, and modems. Connect PowerPort to the H-series for even quicker printing. With features like front panel control, I/O configurability and buffers up to 16Mb, Buffalo devices are the best.

POWERPORT ONLY $59
(Available January 1994)

This new high speed parallel expansion card is designed to print 15 to 20 times faster than the standard parallel card. It's ideal for today's high speed printers like the HP Laser Jet 4. Upgrade your computer with parallel speed of 150,000 CPS and be prepared to be blown away.

486 PERFORMANCE FROM $149



PowerKit CPU upgrades will increase your computer's performance from 75% to 600%. With over 20 PowerKits, you can upgrade over 200 popular computers. Either 286, 386DX, or 386SX.

THE DIFFERENCE

- 45-day refund
- Unlimited technical support
- 5-year warranty
- Free Hyperware™, $49 value, with PowerKits
- Free PLUMP-Rx for CAD plotting $175 value per licensed user.

See your dealer or call Buffalo today to find out more.

1-800-345-2356

BUFFALO

Buffalo Products 2805 19th Street SE, Salem, OR 97302-1520 Fax: 503-585-4505

14FA1

CIRCLE 328 ON READER SERVICE CARD

cial measures, including income versus expenses, budget versus actual expenditures, and aged-accounts payable and receivable. You can't change graph types, but you can customize graphs by, say, viewing Income and Expense by account, customer, or class.

ZOOM POWER

The powerful QuickZoom feature, used in reports and graphs, lets you see the detail behind a line item or graph element with a click of your mouse. With it you can drill down from high-level summaries all the way to individual transactions. QuickBooks also offers helpful minireports throughout the program. Open a list of customers or vendors, for example, and click on the QuickReport button to see a history of your activities with that firm. You can also quickly access a record of transactions made to a particular A/R or A/P entry by clicking on Transaction History.

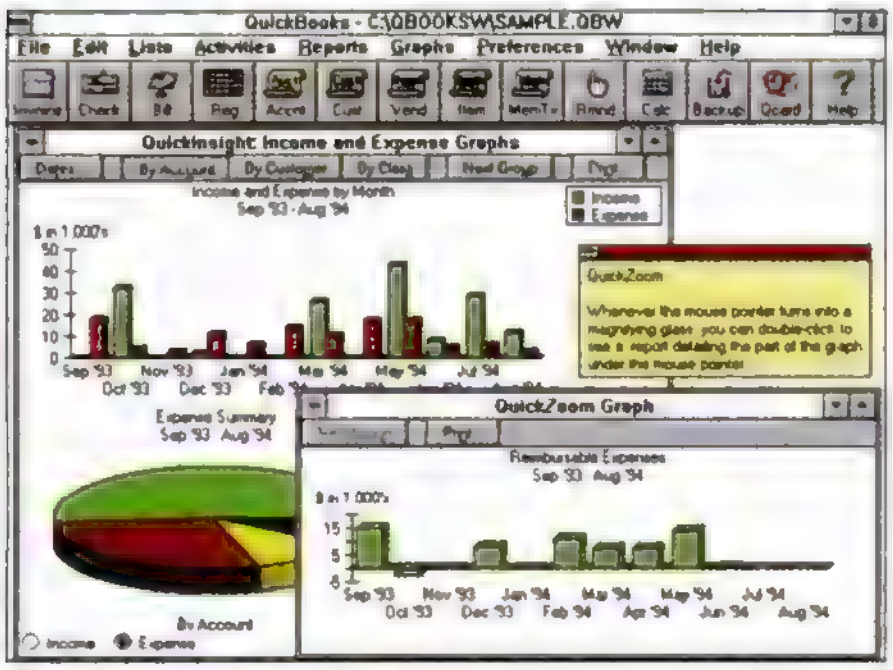
The list of businesses for which QuickBooks will not be an appropriate choice includes those that need to follow all the rules of by-the-book double-entry accounting, and those that need full-blown order entry, inventory, payroll, or any combination of these. But that still leaves a huge number of small businesses whose managers need a truly easy way to track incoming and outgoing money and keep their fingers on the pulse of their companies' financial health. These companies can't go far wrong with QuickBooks.

▶FACT FILE

EDITORS' CHOICE QuickBooks for Windows, Version 2.0

Intuit Inc., 155 Linfield Ave., P.O. Box 3014, Menlo Park, CA 94026-3014; 800-624-8742, 415-322-0573.

Circle 467 on readerservice card



In QuickBooks, QCards and QuickZoom simplify all of your activities, easing the way for even accounting novices.

Sybiz International Inc.

Service Industry Accounting

BY KATHY YAKAL

Service Industry Accounting, Version 3.4 ($299), offers a mixed bag to anyone running a small business and looking for robust accounting functionality at a moderate cost. It gives you more detailed breakdowns of inventory than many products reviewed here, but it offers only one sample chart of accounts and doesn't let you void a check. It does support DDE and offers generous import and export options (ASCII, Lotus 1-2-3, and Microsoft Excel) and a customizable forms designer. The screens, unfortunately, are dull and colorless, with chunky fonts and few graphics. But they do zip along faster than those of many other Microsoft Windows products.

SUITABILITY TO TASK

Service Industry Accounting	POWER	EASE
General accounting	Good	Fair
Managing cash	Good	Good
Managing inventory	Good	Good
Managing information	Fair	Good

Service Industry Accounting (SIA) provides built-in inventory, job-costing, and payroll modules in addition to the standard G/L, A/P, and A/R modules. The package has no dedicated Order Entry module but does have invoicing that links with Inventory. Sybiz International's $249 Sybiz Windows Accounting is essentially the same package minus the job-costing module.

SETTING UP

Setting up your business and using SIA take more knowledge of debits and credits—and the terminology used is more technical—than with some other products. A sample company, along with a tutorial in the manual, introduces the program's operation.

To start your own files, you open a new database, enter some basic information about your business, and decide whether to use passwords. (There are two password levels: supervisor and operator. Operators cannot access Payroll or view the contents of Ledger accounts.) You then enter data about your personnel procedures, make any necessary changes to the chart of accounts, set up your tax codes, and define up to 64 staff members for tracking labor.

Setting up your G/L accounts can be difficult. The manual outlines two sets of steps here—one recommended if your accountant has your G/L up to date, another if your accountant doesn't have it completely ready. Clearly, if you're starting from scratch, this may not be the program for you, since setup is so formidable. While Sybiz claims that SIA is a non-accountant's package, there's not enough depth in its written documentation to guide novices adequately, nor is there context-sensitive help. Telephone technical support costs $150 a year, or you can opt for a per-call basis.

Service Industry Accounting gives you more detailed breakdowns of inventory than many rival products offer.

SIA lets you edit transactions only by making matching journal entries. This makes for a solid audit trail but requires more than a nodding acquaintance with debits and credits. If your books are out of balance and you can't target the problem, the program won't let you exit; you'll have to print a General Journal Report to track down the error and make the adjustment.

GETTING AROUND

Once your G/L accounts are set up, navigation is straightforward. You can create

NOW GET EXACTLY THE 486 PC YOU WANT.

DESIGNED BY YOU.

– You specify exactly what you want. –

BUILT BY THE BEST.

– Manufactured to your order for Inmac by IBM. –

READY TO SHIP IN 72 HOURS.

That's fast, real fast, and includes rigorous testing.
Find out more inside.

inmac

BUILT TO ORDER, READY TO SHIP IN 72 HOURS.

Get precisely the right amount of PC performance and features you need — ready to ship in 72 hours. Designing your built to order Inmac Insignia is a snap. And with no hidden charges for the system you want. Call us and our team of experienced advisors will guide you through every step of the process or you can do it yourself following the easy steps below.

Inmac Insignia 486 PCs are manufactured to your order for Inmac by IBM. And you can add a fabulous selection of high-performance peripherals and software of your choice at an amazingly low price, and with round-the-clock service and support.

1 Each Inmac Insignia system comes standard with MS DOS, Windows, QA Plus, Lotus Organizer software, and an enhanced 101 keyboard & mouse; as well as:

- Accelerated local bus video
- 4 Drive bays
- 4 MB RAM
- 170 MB Drive
- 5 ISA Expansion slots
- 3½ Floppy Drive
- 14" .28 NI SVGA monitor

SYSTEM

1 ☐	450SL – IBM 486SLC2 25/50 MHz CPU	$1299
2 ☐	433P – Intel 486DX/33 CPU	$1599
3 ☐	450P – Intel 486DX2/50 CPU	$1849
4 ☐	466P – Intel 486DX2/66 CPU	$1999

If you need more features and peripherials proceed through the next five steps to specify your own perfect system. Add the price for each option to the basic system price lisings in step one, or simply call Inmac for instant quote.

2 Each Inmac Insignia system comes with 4 MB of RAM. If you need more memory or want to add cache, choose from the list of memory options below.

MEMORY (UPGRADE TO)

5 ☐	8 MB RAM (extra 4 MB)	$230*
6 ☐	16 MB RAM (extra 12 MB)	$690*
7 ☐	32 MB RAM (extra 28 MB)	$1640*
8 ☐	64 MB RAM (extra 60 MB) (not available on 450SL)	$3530*

Call for latest pricing.

CACHE

9 ☐	128 KB cache (not available on 450SL)	$35*
10 ☐	256 KB cache (not available on 450SL)	$59*

3 Each system comes with a 3½" floppy drive and 170 MB IDE hard drive. But you can customize your system to suit your storage needs by adding extra hard or floppy drives. Each Inmac Insignia comes with four drive bays.

HARD DRIVES (UPGRADE TO)

11 ☐	255 MB	$40*
12 ☐	340 MB	$109*
13 ☐	540 MB (requires SCSI interface adapter)	$500*

ADDITIONAL FLOPPY DRIVES

14 ☐	Additional 5¼" FDD	$75*
15 ☐	Replace w/ Dual 3½" and 5¼" FDD	$80*

CD ROM DRIVES

16 ☐	NEC 510 (450 KB/S) (requires SCSI interface adapter)	$389*
17 ☐	Panasonic 563 (150 KB/S)	$199*

4 Each system comes standard with a 14" .28 NI SVGA monitor. You can upgrade to a larger one to have extra room for graphics, desktop publishing, or multiple Windows applications.

MONITOR (UPGRADE TO)

30 ☐	17" .28 NI SVGA Monitor –	$624*

17 YEARS OF THE BEST VALUE AND SERVICE.

Since 1976, Inmac has been recognized for superior service, the broadest PC and Networking product selection and exceptionally low prices.

Fast delivery.

Order a customized Inmac Insignia™ and we'll ship it in just 72 hours. In a hurry? Order a pre-configured system—it ships in only 24 hours.

Manufactered for Inmac by IBM.

Inmac Insignias™ are American engineered and manufactured with award-winning quality.

1-year on-site service, guaranteed.

If your Inmac Insignia™ system fails, we will send a service representative with parts. If they don't arrive when promised, we'll give you a $25 credit on your next order of $100 or more. *(Some remote areas may take up to three business days for service. Call for information.)*

1-year limited warranty.

Inmac Insignia™ systems come with a one year on-site parts and labor warranty against defects in material or workmanship.

Toll-Free 24-hour technical advice.

We've built an ace staff of experts whose sole job is to answer your technical questions... at no charge to you.

30-day satisfaction guarantee.

If you're not satisfied with an Inmac Insignia™ product, contact customer service for a return material authorization, and return it within 30 days for a refund of the original purchase price. *(Shipping/handling charges are not refundable).*

ORDER IT TODAY
1·800·547·5444
FAST SHIPMENT

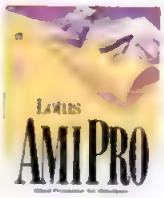
Priority Code #K14501
In Canada call toll free 1-800-387-2173

OUR LOW COST LEASING PLAN MAKES EVERYTHING AFFORDABLE RIGHT NOW.

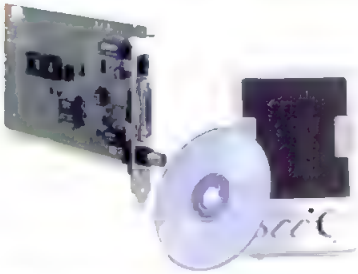
In addition to our low prices, we offer an excellent lease plan to make your Inmac Insignia purchase even more affordable. Payments are as low as $46/month for an Inmac Insignia 450SL priced at $1299. Call Inmac for complete lease option details. Lease prices are based on a 36 month open-end commercial lease. Subject to approved credit with certain terms and conditions. Prices and specifications subject to change without notice.

BUILT TO ORDER · BTO · BUILT TO ORDER · BUILT TO ORDER

5 Each system comes standard with MS DOS, Windows, QA Plus, and Lotus Organizer. We can load any of the latest versions of the hottest selling titles. Check out the bundled suites!



6 Each system comes standard with five expansion slots. Add Ethernet network adapters and a high speed fax/modem to make sure you're well connected. CD-ROM and sound cards are your gateways to the fabulous world of exciting multimedia applications with full motion video and stereo sound.



SOFTWARE**

16 ☐	MICROSOFT WORD	$299*
17 ☐	WORDPERFECT	$289*
18 ☐	LOTUS AMI PRO	$239*
19 ☐	MICROSOFT EXCEL	$299*
20 ☐	LOTUS 1-2-3	$319*
21 ☐	BORLAND QUATTRO PRO	$49*
22 ☐	MICROSOFT MONEY	$15*
23 ☐	BORLAND PARADOX	$129*
24 ☐	MICROSOFT POWERPOINT	$315*
25 ☐	LOTUS FREELANCE	$339*
27 ☐	MICROSOFT OFFICE	$485*
28 ☐	LOTUS SMARTSUITE	$459*
29 ☐	BORLAND OFFICE	$389*

DATA COM/ADAPTERS

31 ☐	3Com Etherlink III Combo 3C509	$130*
33 ☐	Internal 9600/2400 Fax/Modem	$60*
34 ☐	Internal 14400 Baud Fax/Modem	$205*
35 ☐	16-bit Fast SCSI Adapter	$175*

MULTIMEDIA

36 ☐	NEC 510 (450 KB/S) (requires SCSI interface adapter)	$389*
37 ☐	Panasonic 563 (150 KB/S)	$199*
38 ☐	Creative Labs Sound Blaster 16	$199*
39 ☐	Media Vision Pro Audio Spectrum 16	$169*

*Add price to base price of system.
**Software programs are for MS Windows.

WE'LL HELP YOU DESIGN YOUR SYSTEM.

We have a friendly and knowledgeable team of experts ready to help you specify your system and take your order. Call TOLL-FREE 1-800-547-5444 for your instant price quote. Order an Inmac Insignia built just for you.

It's easy to order from Inmac. Use your Visa, MasterCard, or American Express credit card. Or, you can lease. Corporate buyers, call us and ask about setting up an open account.

30 SATISFACTION DAY GUARANTEE

24 HOUR SUPPORT

Priority Code #K14501

ORDER TOLL FREE 1-800-547-5444

NEED IT FASTER! PRE-CONFIGURED SYSTEMS SHIP IN JUST 24 HOURS.

INMAC Insignia 450 SL

K1005PC **$1299**
Lease Option $46/month

- IBM 486SLC2 25/50 MHz CPU with 16 KB internal cache
- Accelerated local bus graphics with 1 MB display RAM
- 5 ISA slots and 4 drive bays.
- 4 MB RAM, upgradeable to 32 MB
- 170 MB, 16 ms IDE hard drive
- 14", .28 pitch non-interlaced 1024x768, 72 Hz flicker-free SVGA color monitor
- Enhanced 101-key keyboard and mouse
- 3.5" floppy drive, one parallel port, two serial ports
- MS DOS, MS Windows, QAPLus, Lotus Organizer software, FREE

INMAC Insignia 433P

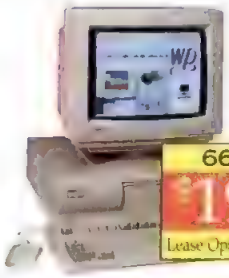
K1002PC **$1599**
Lease Option $56/month

- i486 DX/33 MHz CPU with 8 KB Write-Thru cache
- Accelerated local bus graphics with 1 MB display RAM
- 5 ISA slots and 4 drive bays
- Upgradeable to Pentium Technology
- 4 MB RAM, upgradeable to 64 MB
- 170 MB, 16 ms IDE hard drive
- 14", .28 pitch non-interlaced 1024x768, 72 Hz flicker-free SVGA color monitor
- Enhanced 101-key keyboard and mouse
- 3.5" floppy drive, one parallel port, two serial ports
- MS DOS, MS Windows, QAPLus, Lotus Organizer software, FREE

INMAC Insignia 450P

K1003PC **$1849**
Lease Option $72/month

- i486 DX2/50 MHz CPU with 8 KB Write-Thru cache
- Accelerated local bus graphics with 1 MB display RAM
- 5 ISA slots and 4 drive bays
- Upgradeable to Pentium Technology
- 4 MB RAM, upgradeable to 64 MB
- 170 MB, 16 ms IDE hard drive
- 14", .28 pitch non-interlaced 1024x768, 72 Hz flicker-free SVGA color monitor
- Enhanced 101-key keyboard and mouse
- 3.5" floppy drive, one parallel port, two serial ports
- MS DOS, MS Windows, QAPLus, Lotus Organizer software, FREE



INMAC Insignia 466P

K1004PC **$1999**
Lease Option $78/month

- i486 DX2/66 MHz CPU with 8 KB Write-Thru cache
- Accelerated local bus graphics with 1 MB display RAM
- 5 ISA slots and 4 drive bays
- Upgradeable to Pentium Technology
- 4 MB RAM, upgradeable to 64 MB
- 170 MB, 16 ms IDE hard drive
- 14", .28 pitch non-interlaced 1024x768, 72 Hz flicker-free SVGA color monitor
- Enhanced 101-key keyboard and mouse
- 3.5" floppy drive, one parallel port, two serial ports
- MS DOS, MS Windows, QAPLus, Lotus Organizer software, FREE

450SL Home Office Bundle just $1699

Order your Inmac Insignia 450SL with the Home Office hardware and software bundle and save hundreds of dollars. You get the standard configuration 450SL plus extra hardware and over $1300 worth of top brand software. All for just $1699. You save $900 off list price!

- Internal 9600/2400 Fax/Modem
- Microsoft Money for Windows
- Comm/Fax Software
- WordPerfect for Windows
- Quattro Pro for Windows

INMAC INSIGNIA 450SL *Home Office Bundle*
K1013PC **$1699**
Lease Option $60/month

Business Office Bundle just $2399

You save more than $1500 when you order your Inmac Insignia 450P computer Business Office Bundle. You get additional RAM plus a quartet of top brand software. Everything you need to get to work the minute you plug your system in. We'll install and test it all for you, FREE.

- Additional 4 MB RAM, total of 8 MB
- Quattro Pro for Windows
- Central Point PC Tools for Windows
- WordPerfect for Windows
- Paradox for Windows

INMAC INSIGNIA 450P *Business Office Bundle*
K1015PC **$2399**
Lease Option $92/month

Call Us Toll Free 1-800-547-5444
Fax us at 1-800-972-3210
In Canada call toll free 1-800-387-2173
(Prices and delivery may differ, please inquire).

PRIORITY CODE: K14501
Please use your priority code when ordering.

ORDER IT TODAY
1·800·547·5444
FAST SHIPMENT

It's easy to order from Inmac. Use your Visa, MasterCard, or American Express credit card. Corporate buyers, call us and ask about setting up an open account.

inmac
P.O. Box 168065, Irving, Texas 75016-9901

All prices and specifications subject to change without notice. Not responsible for typographical errors.
Copyright 1993, Inmac Corporation. Inmac Insignia and Inmac are trademarks or registered trademarks of Inmac Corporation. IBM is a registered trademark of IBM Corporation. All other product or service names mentioned are trademarks of their respective owners.

records for customers, vendors, and the like through a simple fill-in-the-blank process aided by pop-up lists and dialog boxes.

Each module's first working screen consists of a list of its components. Only a partial list appears at any one time; to see more, you'll have to click on one of the index headings (for example, asset and equity in G/L, or segments of the alphabet in Sales). Action buttons along the bottom move you into the transaction screens and give you access to more information about the account.

The level of detail beneath these action buttons is amazing and the product's main strength. You can work your way through a customer's history to see, for example, transaction histories; balances outstanding for 30, 60, or 90 days; and an activity graph for the past year. All modules offer these quick, easy inside looks.

REPORTING FEATURES

SIA's generous selection of reports can be accessed via icon or menu. You highlight the report of your choice on the list and choose whether to print to screen, disk, file, or the Clipboard. Most reports are far too wide to appear on the screen in their entirety, and while there are horizontal scroll bars, there are no vertical scroll bars. You have to keep clicking a button to go forward or back a page. Generally, the only customizing you can do is to change fonts and specify dates or accounts. You can create simple bar graphs to view patterns of customer or vendor activity; graphs aren't customizable, however, or accessible when you're generating reports.

SIA seems most appropriate for people who have special needs in job costing and inventory—needs too small to warrant buying a multimodule package yet too great to be handled by other products in this group. This package has too much power and not enough handholding for beginners and simpler businesses.

▶FACT FILE

Service Industry Accounting, Version 3.4
Sybiz International Inc., 39210 State St., Fremont, CA 94538-1546; 510-713-6742, 510-713-6748; fax, 510-791-1548.
Circle 468 on reader service card

Digital Dollars & Silicon Cents

Finance managers now go beyond checkbook tracking, with such features as links to bill-paying and stock-quote services.

by Gregg Keizer

Balancing a checkbook on a computer was once electronic overkill, akin to pounding a ten-cent nail with a pile driver. The computer was an electronic file folder—nothing more.

The services provided by today's personal finance managers are far from trivial. Beyond cutting checks and reconciling bank accounts, even the weakest programs can help you make budgets and monitor the fortunes of your investment portfolio. The best remind you when payments are due and provide the kind of tax planning and general financial advice you might get from a conversation with your accountant. Some even pay bills, gather stock quotes, and manage credit cards over the phone.

SAVE, SAVE, SAVE

The five packages we review here—Dollars & $ense, Kiplinger's CA-Simply Money, Managing Your Money, Quicken for DOS, and Quicken for Windows—each start with the familiar checkbook. Each displays on-screen check forms for you to complete, records checks in a register, and prints them, if you wish. As the months go by, you build a trail of transactions to show where the money goes.

By tracking *all* your accounts, such software paints a big picture of your finances. When bank statements arrive, these packages virtually balance accounts for you and provide comprehensive predefined and customizable reports and charts. At tax time, all compile summary reports detailing taxable expenses. Along the way, they help you monitor budgets and calculate debt.

A personal finance package saves time by automating common, repetitive chores and saves money by watching for stock downturns, tracking taxable deductions, and reminding you to pay bills promptly. The overall result is more efficient and informative than shoebox-based financial management.

WHAT'S NEW

The five programs reviewed here aren't your only financial choices. Last year's roundup (January 12, 1993) covered nine packages, while this story focuses only on those that have debuted or changed since then. Also, Parsons Technology's new

version of MoneyCounts for Windows just missed our deadline.

Simplifying initial setup and daily operations is a perpetual theme of the evolution of personal finance software. For example, most programs now walk users through the creation of mortgage, portfolio, and other kinds of complex accounts. CA-Simply Money aims at automating your financial life by providing one-click buttons for completing most tasks. Intuit's Quicken for DOS and Quicken for Windows, meanwhile, introduce a PIM-like calendar with links to future payments: To schedule a transaction, you just note it on the calendar. Reporting, too, is changing. In an attempt to give us access to all the numbers, programs such as Quicken for DOS and Quicken for Windows can drill down through data layers to show associated transactions. Today's packages also help you build budgets. They let you set budgets according to previous periods and warn you when you've gone over the limit. And most programs now clearly tag payments to loans so you can always see how much you owe. Managing Your Money even helps you plan strategies for getting out of debt.

IN THIS REVIEW

Dollars & Sense.....238
Kiplinger's CA-Simply Money.....240
Managing Your Money.....240
Quicken for DOS.....244
Quicken for Windows.....244

None of the five reviewed programs are substitutes for a dedicated tax-preparation program, but all are definitely tax-aware. They each provide reports on taxable expenses, and Managing Your Money and Quicken for Windows can now drop their data directly into popular tax-preparation packages.

Investment management is another area receiving increased attention from today's programs. Newcomer CA-Simply Money, for example, includes a relatively full suite of tools to record, track, and analyze securities. Meanwhile, the Quicken packages have dramatically beefed up their portfolio sections with one-stop-shopping perspectives of all your securities. Also, more programs can download stock quotes from on-line services. These include Managing Your Money and CA-Simply Money (via internal connections) and Quicken for Windows (by virtue of an available add-on).

Today's software also stresses financial analysis by offering either direct advice or richer and easier-to-use sets of customizable reports and charts. Also, special-purpose financial calculators are pitching in to help you, say, plan for retirement or untangle the mysteries of refinancing. Finally, programs like Managing Your Money, Quicken for DOS, and Quicken for Win-

PC MAGAZINE

EDITORS' CHOICE

- **Managing Your Money**
- **Quicken for DOS**
- **Quicken for Windows**

In the fast-changing world of PC software, it's little short of astounding when anything remains stable for as long as a year. Nonetheless, our Editors' Choices are identical to those in a similar roundup just over a year ago. Three products from two companies—the latest versions of MECA Software's Managing Your Money and Intuit's Quicken for DOS and Quicken for Windows—have, collectively, maintained their excellence relative to the rest of the market while continuing, individually, to grow.

Managing Your Money, Version 10.0, remains the package of choice for those with sophisticated portfolio-management needs. While the Quicken products are catching up in this respect, Managing Your Money remains a nose ahead. The package features the built-in ability to dial up and download securities quotes from on-line services and lets you preset specific price levels and enable alerts to notify you when they are hit. Managing Your Money also provides the most comprehensive built-in financial advice here and can even coach you on how to reduce your personal debt.

Intuit has made good on its commitment to make its Quicken products ever easier to use, and for that—if nothing else—Quicken for DOS, Version 7.0, and Quicken for Windows, Version 3.0, deserve honors. This year's most exciting ease-of-use advance is the addition of a financial calendar. Added to both packages, it allows for effortless scheduling of future financial transactions. Though the Windows version's calendar is markedly slicker, the DOS version's calendar also gets the job done.

Both Quickens have made major strides in portfolio management as well. Each now offers a comprehensive Portfolio View screen that provides a one-stop "office" for tracking just about all of your investment activities. The investment section of the highly automated report module lets you keep a finger on the pulse of your financial health by providing you with multiple ways of quickly viewing important aspects of securities performance. The Quicken pair's drill-down reporting and electronic links to the IntelliCharge card are innovative and remain unchallenged.

Newcomer Kiplinger's CA-Simply Money, Version 1.0, pioneers an intriguing new drag-and-drop, icon-based user interface, which, along with the program's easy setup, makes it a good bet for those with minimal needs—or for those intimidated by finances. And its current availability—it's free (with a $6.95 charge for shipping and handling) until April 15—is certainly right for those who want to get their feet wet with personal finance software without making a big financial commitment.

Introducing IBM C Set ++ V2.1 and KASE:Set.

Object oriented development.

C Set ++ Version 2.1 for OS/2® from IBM Software Solutions is one of the most complete object-oriented application development package you can buy.

Plus.

Its 32 bit C/C++ compiler, with its advanced code optimizer *and* WorkFrame/2 V2.1 - a completely new development environment based on OS/2's object-oriented Workplace Shell - allows you to create up-to-the-minute mission critical applications.

C Set ++

You also receive a specially tailored copy of Kaseworks KASE:Set, a visual design and code generation tool which allows you to build visual applications even more quickly, with a minimal investment in learning time.

Plus!

C Set ++ Technical Features

- Standards conforming C/C++ compiler.
- Optimizer for i386, i486 and Pentium™ processors.
- Extensive C++ Class Libraries plus NEW drag/drop support.
- Visual PM Debugger with object-oriented features.
- Graphical C++ Class Browser.
- Visual Trace Analysis tool.
- Precompiled headers.
- Developer's ToolKit new V2.1 with tools for multimedia and SOM applications.

To order C Set ++ for OS/2 including KASE:Set, or for futher information call 1-800-342-6672 (U.S.A.) or 1-800-465-7999, ext. 676 (Canada). Or contact your local IBM software dealer.

IBM and OS/2 are registered trademarks and C Set ++ is a trademark of International Business Machines Corporation.
KASE:Set is a trademark of Kaseworks. Pentium is a trademark of Intel Corporation.
© 1993 IBM Corp.

IBM

Suitability to Task: Personal Finance Managers

Personal finance managers should make money management faster and easier while providing insight into your financial situation. These Suitability to Task ratings compare personal finance managers on their abilities to handle the most common money-management chores quickly and easily. They also evaluate the level of information analysis you can glean from the data you have collected. We divided tasks into five categories: checkbook management, budgeting, tax and financial planning, portfolio management, and electronic connections.

SUITABILITY TO TASK

Product Name

	POWER	EASE
Checkbook management	Poor	Excellent
Budgeting	Fair	Good
Tax and financial planning	Good	Fair
Portfolio management	Excellent	Poor
Electronic connections	N/A	N/A

N/A—Not applicable. The product does not perform this task

Checkbook management is the core of every personal finance manager. In order to receive an excellent rating, a program should assist users in setting up their accounts. It should fully automate the process of writing and recording income and expenses, remembering recurring transactions and handling many of the data entry chores. The program should also assist in account reconciliation and allow users to edit and add transactions from within the reconciliation module.

A good finance manager also helps you watch where your money is going. **Budgeting features**—such as sorting income and expenses by category, setting spending and earnings objectives, and providing detailed reports—can provide insight into your finances. A good budgeting module can help you spot unusual spikes in your spending and find places ripe for cutting.

Once you have collected all this data, it is good to have help with **tax and financial planning.** The better finance managers help you figure out your tax liability throughout the year, enabling you to take action to reduce your tax burden. They should also help you make smart decisions about loans and savings plans.

The logical extension of checkbook management is **portfolio management.** A package should be able to track a wide variety of investments such as stocks, bonds, and mutual funds, and differing transaction types, such as dividend reinvestments and selling short. The program should be able to track investment goals and provide advice to help you make decisions.

Electronic connections to bill-paying services or on-line stock quotes can keep you on time with payments and up to date on prices. Some programs even allow electronic access to credit-card information.

dows integrate with electronic bill-paying services.

TESTING: ONE, TWO, THREE

We put our quintet through a slew of tests that mimicked both the day-to-day and the long-term practices of a typical user. We created a variety of accounts and then entered several months' worth of transactions to test handling of such elements as repetitive entries, account reconciliation, and links between accounts. We built household budgets and tagged categories as tax-related to test general reporting, tax planning, and cash-flow charting. We recorded, tracked, and updated a variety of investments. Finally, we checked out electronic connections, from on-line stock quotes to electronic bill-paying.

More than anything else, our tests revealed that picking the right program depends on your special needs. All of the packages here (except for Dollars & $ense) are capable electronic checkbooks that can handle most any personal financial assignment. Probe deeper, though, and clear differences begin to show. CA-Simply Money gives you a quick start and simple operation but lags when your finances get complicated. For more power, you'll want to turn to either flavor of Intuit's Quicken. And Managing Your Money retains an edge—shrinking though it is—when you're serious about Wall Street.

Millions of PC users already manage their money with personal finance software. Millions more would be smart to hand the checkbook over to the computer, for when the PC puts its accounting shades on, it can save more than just a few minutes of your time; it can save you money. And that's no joke.

Software Developers Consortium

Dollars & $ense

ALL REVIEWS BY GREGG KEIZER

With smarter financial software just itching to hit your hard disk, picking Software Developers Consortium's Dollars & $ense, Version 3.4 ($69.95), as your electronic checkbook makes no sense. This decidedly retro-looking DOS program may give you the basics of check writing and budgeting, and even show some small skill in managing your portfolio and helping with taxes, but it's beset with problems ranging from the merely irritating to the potentially disasterous. It's awkward to use and limited in abilities.

Dollars & $ense gives you comparatively little help in getting started. For example, none of the budget categories are initially tagged as taxable. Also, the main menu tends to bury common tasks—such as check printing and entering payments—under cryptic labels.

SUITABILITY TO TASK

Dollars & $ense

	POWER	EASE
Checkbook management	Fair	Poor
Budgeting	Fair	Fair
Tax and financial planning	Poor	Fair
Portfolio management	Poor	Fair
Electronic connections	N/A	N/A

GETTING TO WORK

Once you do find it on the menu, check printing is a snap; Dollars & $ense lets you print checks by either date or number range. Reporting and graphing features, though not extravagant, quickly show cash

Our Contributors: GREGG KEIZER is a free-lance writer for a variety of computer, technology, science, and entertainment publications. TED STEVENSON was the associate editor in charge of this story, and BEN Z. GOTTESMAN was the project leader.

Do You Make These Six Common Mistakes On Your Taxes?

EasyStep

Six common mistakes can cause you big headaches on your taxes. An oversight here, an omission there. From unnecessary tax payments to full blown IRS audits -- you can end up paying too much ... or worse.

But now, using TurboTax and your personal computer, you can avoid these simple but costly mistakes:

1 The Arithmetic Error
Today, even the simplest forms contain complex calculations. And with all the late-night scrambling, an innocent mistake could cost you plenty.

2 The Transcription Error
With all those numbers being juggled from schedule to schedule, it's no wonder the figures are so often transcribed incorrectly or entered on the wrong line.

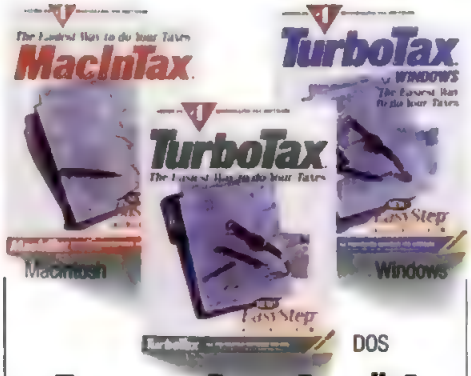
3 The Omitted Form
Even "ordinary" returns require anywhere from six to a dozen forms to complete. It's easy to miss one ... or end up rushing all over town to find the one you need.

4 The Misinterpreted Instruction
At best, IRS instructions can be tough to understand. At worst they can be mind-boggling. What you need are clear directions in plain English.

5 The Overlooked Deduction
You'd have to be a professional tax preparer to know all the deductions you're entitled to. If you miss just one, it could cost you hundreds of dollars.

6 The Exceeded Guideline
The fastest way to trigger an IRS audit is to exceed the "normal" range on one of your deductions. You need to know what the IRS looks for on a line-by-line basis.

When you do your taxes with TurboTax, mistakes like these are virtually impossible. And filing your taxes couldn't be easier.



America's #1 Tax Software

TurboTax is America's #1 best-selling tax software -- over seven million returns were filed with TurboTax last year! With TurboTax on your PC (or MacInTax on your Macintosh) and the award-winning EasyStep® tax preparation process, you can completely and accurately prepare your income taxes in just a few hours.

Here's how easy it is!

A. *Gather your records and receipts.*
B. *Enter your data into TurboTax.*
C. *Print out, sign and drop in the mail.*

TurboTax does the rest. Even if your records and receipts aren't in any particular order, TurboTax's new EasyStep system will guide you every step of the way. And like a good tax advisor, TurboTax helps you identify every deduction you can claim.

PC MAGAZINE EDITORS' CHOICE TURBOTAX FOR DOS

Then TurboTax makes all the calculations, checks for accuracy and consistency, and transfers every number to the proper lines on the proper forms. And, TurboTax prints every form you need in IRS-approved format right on your own printer -- ready to sign and mail (or file electronically, if you prefer, for a faster refund).

We know that if you try it, you'll never go back to doing your taxes the old-fashioned way. In fact, we back TurboTax with our 5 Point Guarantee:

1. **Guaranteed Easy to Use.**
2. **Guaranteed Accurate.**
3. **Guaranteed Complete.**
4. **Guaranteed Support.**
5. **Guaranteed Faster.**

PC Magazine says TurboTax "...is clearly the best of the 1992 tax programs." Try it for yourself.

Free Bonus-- Dinosaur Adventure!

The fun way for the whole family to learn the real story of the dinosaurs! Includes full color, sound and motion video, two games, and an encyclopedia. For ages 3 and up, **no CD ROM player required**. FREE with your order!

☐ **Yes, I'll try TurboTax RISK-FREE!** *Rush me TurboTax ASAP and charge my first monthly payment of $9.99 to my credit card below. For each of the 3 months thereafter, charge me an additional installment of $9.99. If I don't like it for any reason, I'll just send it back by April 15, 1994 and my payments will be refunded.*

Please Choose:
☐ 3-½" disks, or
☐ 5-¼" disks
☐ TurboTax (IBM®-compatible)
☐ TurboTax for Windows™
☐ MacInTax (for Macintosh®)

Name _____
Address _____
City _____ State _____ Zip _____
Daytime Phone ( ) _____
Bill My: ☐ Visa ☐ MasterCard ☐ Discover ☐ Amex
Card # _____ Exp. Date _____
Signature _____

☐ Check enclosed for the full amount (plus $7.00 S+H and sales tax as shown below)-- payable to ChipSoft

SATISFACTION GUARANTEED
If you're not satisfied with TurboTax or MacInTax for any reason, just return it by April 15, 1994 for a full refund
No Questions Asked.

4 Monthly Installments $9.99 Plus S&H

Mail your order to: ChipSoft, 2650 E. Elvira Rd., #100
Or Call NOW: Tucson, AZ 85706

1-800-964-1040
ext. E322

[illegible]

flow and whether or not you're within your budget. The program also helps estimate your tax liability within a worksheet, which you can change to reflect your tax rate and number of dependents. Unfortunately, it doesn't print specific tax schedules to simplify assembling figures at tax time.

Dollars & $ense lets you link accounts—key to such tasks as tracking loan payments you've made. But it offers little guidance here; you'll have to work out the details yourself. Though you can set up complex accounts holding several kinds of securities, the program just barely manages as a portfolio tracker.

Indeed, Dollars & $ense's problems generally outweigh its abilities. Transactions memorized within one account are not available inside another, and entire sections of the program are undocumented, making it tough to figure out complicated chores such as reinvesting mutual funds within an investment account.

Much worse, you can permanently abandon the reconciliation process without balancing an account, leaving your books dangerously out of sync. Moreover, scheduled future transactions subtract moneys as soon as they're entered, not when they're posted or printed. You may never know exactly how much is in your account.

Dollars & $ense is firmly stuck in the past of personal finance software. With so many truly capable money managers around, you're better off looking to another program—and the future.

▶FACT FILE

Dollars & $ense, Version 3.4

Software Developers Consortium, 6070 S. 1300 East, Salt Lake City, UT 84121; 801-288-1222; fax, 801-288-2216.

Circle 456 on reader service card

Computer Associates International Inc.

Kiplinger's CA-Simply Money

If you miss out on Computer Associates International's giveaway of Kiplinger's CA-Simply Money, Version 1.0, you'll miss getting something substantial for virtually nothing. The product is free—with a $6.95 charge for shipping and handling—until April 15, whereupon the price becomes $69.99. This is still a reasonable deal for anyone who sticks to the basics. This Windows-based, icon-driven personal finance manager is easy to set up and use, and it handles day-to-day banking almost as well as the Quicken products.

CA-Simply Money goes beyond the simple checkbook metaphor, supplying dedicated icon buttons that you click, drag, and drop to carry out a wide variety of money-management tasks. You can also create your own buttons. Phone bill due? Just drag the phone company button onto the checkbook icon. This approach may wear thin for some, since it's easy to lose control and flood the screen with buttons (especially after you've accumulated a substantial number of payees, income sources, and accounts). You can, however, both hide and group buttons to eliminate clutter.

SUITABILITY TO TASK

Kiplinger's CA-Simply Money

	POWER	EASE
Checkbook management	Good	Good
Budgeting	Good	Good
Tax and financial planning	Good	Good
Portfolio management	Fair	Fair
Electronic connections	Poor	Good

SIMPLE SETUP

CA-Simply Money offers the easiest setup of any of the titles reviewed here. Its preconfigured accounts include those for checking, savings, investments, and credit cards. Even something as tricky as creating an up-to-date mortgage account and linking it to a checkbook is a snap. With this package, you'll get started faster—and with less poring over the manual—than you will with Quicken for Windows.

Other aids are nearly as impressive. A pop-up financial advisor monitors your data and offers advice. When credit-card debt gets out of hand, for example, the advisor suggests ways to decrease it. Also, "coaches" steer you through the program's operation. CA-Simply Money memorizes transactions, so typing in a few characters can bring up the correct transaction. And though there's no calendar interface for scheduling, the package can handle almost any future transaction.

Once you get past typical banking tasks, CA-Simply Money can't match the Intuit powerhouses. Its reports and graphs, for instance, don't let you drill down into the underlying data, which you can do in both of the Quicken products.

Nor can the portfolio manager instantly show all your accounts in the kind of detail that the Quicken pair's Portfolio View screen offers. It's easy to conduct basic investment business, from buying securities to assigning dividends, but more advanced techniques, such as dealing with stock lots, require workarounds. CA-Simply Money can download quote updates, however.

While tax help within CA-Simply Money is scanty, the new CA-Simply Tax—a dedicated tax-preparation package, also free until April 15—imports from and is now bundled with CA-Simply Money. Electronic bill-paying and credit-card statements are not integrated into the program.

CA-Simply Money's button interface and quick start make it a good first-time PC checkbook, but it's not for the sophisticated money manager working in Windows.

▶FACT FILE

Kiplinger's CA-Simply Money, Version 1.0

Computer Associates International Inc., One Computer Associates Plaza, Islandia, NY 11788-7000; 800-225-5224, 516-342-5224; fax, 516-342-5734.

Circle 457 on reader service card

MECA Software Inc.

Managing Your Money

MECA Software's Managing Your Money, Version 10.0 ($79.95), is still the brawniest—and in many ways the brainiest—DOS-based personal finance package. Even though Intuit's updated Quicken products have sliced into its lead, this advice- and feature-packed program remains the package of choice for the serious investor. With its complete control of the basics, superb operational shortcuts, and breezy approach to difficult topics, Managing Your Money has an appeal that extends to anyone who wants to digitize dollars and cents.

Getting started is a snap with Managing Your Money, which not only walks you through creating your first bank account but also tutors you in entering paycheck information and setting up your first portfolio account. The excellent on-

▶ SUMMARY OF FEATURES

Personal Finance Software

Products listed in alphabetical order ■=YES □=NO	Dollars & Sense	Kiplinger's CA-Simply Money	Managing Your Money (PC MAGAZINE EDITORS' CHOICE)	Quicken for DOS (PC MAGAZINE EDITORS' CHOICE)	Quicken for Windows (PC MAGAZINE EDITORS' CHOICE)
List price	$69.95	$69.99 (free until April 15)	$79.95	$69.95	$69.95
User interface	DOS	Windows	DOS	DOS	Windows
General Features					
Calculator/Calendar	□□	■■	■■	■■	■■
On-line "coach"	□	■	■	■	■
Sample data	■	■	□	□	□
Help with accounting principles	□	■	■	■	■
Banking Functions					
Memorizes recurring transactions	■	■	■	■	■
Schedules future transactions	□	■	■	■	■
Reconciles account	■	■	■	■	■
Links to electronic credit-card statements	□	□	□	■	■
Bill Payment					
Provides bill payment reminders	□	■	■	■	■
Interface to BillPay USA/CheckFree	□□	□□	■■	□■	□■
Prints laser, ink jet, and dot matrix checks	■	■	■	■	■
Prints check register	■	■	■	■	■
Budgeting Features					
Includes preset budget categories	■	■	■	■	■
Splits transactions among categories	■	■	■	■	■
Automatically sets up budget account	□	■	■	■	■
Reports					
Number of predefined reports	7	37	75	25	27
Custom reports	■	■	■	■	■
Creates an instant report from any transaction	□	■	■	■	■
User can view supporting data or transactions from report view	□	□	□	■	■
User can preview reports on-screen	■	■	■	■	■
Charts and Graphs					
Number of predefined charts	12	31	18	18	50
User can view supporting data or transactions from chart view	□	□	□	■	■
Custom charts	□	■	■	■	■
Portfolio Management					
Supports multiple portfolios	■	■	■	■	■
Links to on-line quote service	□	■	■	■	■*
Financial Planning					
Calculates loan amortization tables	□	■	■	■	■
Number of financial-planning calculators	None	5	18	5	5
Debt-management planning	□	□	■	□	□
Loan Tracking					
User can link loan account to checking account	■	■	■	■	■
Credits loan account when payment is made from checking	■	■	■	■	■
Automatically splits payment between principal and interest	■	■	■	■	■
Tax Planning					
Estimates tax liability	■	■	■	□	■*
Data is directly readable by / exportable to major tax programs	□□	■■	■■	■■	■■
Business Uses					
Can generate invoices	□	□	■	□	□
Automatically calculates payroll deductions	□	□	□	□	□
Companion invoicing/payroll software available	□□	□□	■■	□■	■■
Technical Support					
Unlimited free support	□	■	■	■	■
Toll-free support	□	□	□	□	□

* Via Quicken Companion 2.0 for Windows.

line help and never-stuffy documentation give you a hand when you need it.

TRANSACTION TRIPLE THREAT

Managing Your Money automates much of the process of working within its checkbook-style interface. You can call up any past payee by typing its first few letters and hitting a function key. The Quick List feature lets you memorize transactions and recall them singly or in groups. And with the Alert List feature, you can schedule recurring transactions. The program warns you of due transactions at start-up and lets you record them instantly.

When you balance your checkbook, the Reconcile Magic feature spots problems, such as transposed numbers or incorrectly

SUITABILITY TO TASK

Managing Your Money

	POWER	EASE
Checkbook management	Good	Excellent
Budgeting	Excellent	Good
Tax and financial planning	Excellent	Excellent
Portfolio management	Excellent	Good
Electronic connections	Excellent	Excellent

cleared transactions. The program doesn't automatically rectify problems, but it flags suspect items for your examination.

The other basic bookkeeping functions are simple, powerful, or both. You can build a new budget by inflating or deflating past amounts, prepay loans with ease, and transfer moneys between accounts with a couple of keystrokes.

STILL SERIOUS AFTER ALL THESE YEARS

As easy as it makes day-to-day banking, Managing Your Money really shines when you use it to track your investments and plan your finances and taxes. No other program offers so much financial advice or includes so many special-purpose financial calculators. And its tax-planning aids are the most comprehensive of any product reviewed here. A 1040 worksheet helps estimate your tax liability, and individual schedules collate the appropriate income and expenses.

Although Intuit has greatly improved the Quicken products' portfolio management, Managing Your Money is still best for anyone who reads the business section

WHY BUY COMPUTER WH NEW PRICES

All our PCs are backed by the COMPAQ' free 3-year warranty'—the first such warranty in the industry. We can offer this kind of long-term guarantee because of our quality and testing standards. Prices include COMPAQ Monitors. Call for details on other COMPAQ desktops and notebooks, as well as printers.

COMPAQ ProLinea™ 4/33s
*33-MHz 486SX, 4-MB RAM, 120-MB hard drive, SVGA Color Monitor. Performance with extraordinary affordability. Or lease for $53 per month.**

†Restrictions and exclusions apply. Monitors, battery packs and certain options are covered by a one-year warranty. *Leasing is provided by GE Capital Services for a term of 36 months, and is subject to approved credit and certain terms and conditions. Call for details. **Requires a 1024 Color Monitor. ©1993 Compaq Computer Corporation. All rights reserved. Printed in the USA. Compaq, the COMPAQ logo, LTE and DESKPRO are Registered with U.S. Patent and Trademark Office. Contura and Presario are trademarks of Compaq Computer Corporation. COMPAQ DirectPlus is a service mark of

Any Other
en Compaq Has
Like These?

COMPAQ ProLinea 4/25s
*25-MHz 486SX, 4-MB RAM, 120-MB hard drive, SVGA Color Monitor. Great for everyday business applications. Lease for $49 per month.**

COMPAQ ProLinea 4/33
*33-MHz 486DX, 4-MB RAM, 120-MB hard drive, SVGA Color Monitor. Designed for more advanced applications. Lease for $63 per month.**

COMPAQ ProLinea 4/66
*66-MHz 486DX2, 4-MB RAM, 120-MB hard drive, SVGA Color Monitor. For high performance at an affordable price. Lease for $75 per month.**

ProLinea Features

3½" 1.44-MB diskette drive ◆ 1024 x 768 local bus video graphics with 1-MB VRAM in up to 256 colors (on 486 models) ◆ 3 expansion slots ◆ 3 internal storage device positions ◆ Security features ◆ COMPAQ Color Monitor, preinstalled MS-DOS 6 and Microsoft Windows 3.1 and a COMPAQ Mouse.

DESKPRO®/i Features

3½" 1.44-MB diskette drive ◆ Integrated QVision Graphics displays up to 256 colors at 1024 x 768 with 512-KB VRAM option™ ◆ 3 expansion slots ◆ 3 internal storage device positions ◆ Security features ◆ Business Audio ◆ COMPAQ Color Monitor, preinstalled MS-DOS® 6 and Microsoft® Windows™ 3.1 and a COMPAQ Mouse.

COMPAQ DESKPRO 4/25is
*25-MHz 486SX, 4-MB RAM, 120-MB hard drive, SVGA Color Monitor. Delivers fast, high-resolution graphics in Windows. Lease for $51 per month.**

COMPAQ DESKPRO 4/33i
*33-MHz 486DX, 4-MB RAM, 120-MB hard drive, SVGA Color Monitor. For even faster performance in a Windows environment. Lease for $64 per month.**

LTE Lite Features

3½" 1.44-MB diskette drive ◆ Power conservation and security features ◆ Auxiliary battery ◆ AC Adapter ◆ MS-DOS 6 and Microsoft Windows Preinstalled ◆ EZ Help On-Line Library ◆ Slipcase ◆ Integrated Trackball and an Expansion Base Connector.

Contura Features

3½" 1.44-MB diskette drive ◆ Power conservation and security features ◆ Battery Pack ◆ AC Adapter ◆ Preinstalled MS-DOS 6, Microsoft Windows 3.1 and EZ Help On-Line Library and a COMPAQ Trackball.

COMPAQ Contura™ 4/25
*25-MHz 486SL, 4-MB RAM, 120-MB hard drive, monochrome VGA display, 6.2 lbs. Upgradeable to Active Matrix Color Display. Lease for $72 per month.**

COMPAQ LTE® Lite 4/25
25-MHz 486 SL, 4-MB RAM, 120-MB hard drive, monochrome VGA display, 6.2 lbs. A full-featured notebook with desktop capabilities. ***$2149. Or lease for $77 per month.****

COMPAQ DirectPlus

1-800-888-5951

Ask for our new free catalog.

Compaq Computer Corporation. Products, prices and programs are subject to change without notice. All products are trademarks or registered trademarks of their respective companies. Microsoft and MS-DOS are registered trademarks, and Windows is a trademark of Microsoft Corporation. The Intel Inside Logo is a registered trademark of Intel Corporation. Offer available in the U.S. only

before the sports page. Its tracking of discrete lots of purchased stocks is sophisticated, and you can easily enter short sells, capital gains, and dividend reinvestments. Also, it retrieves quotes from Dow Jones and CompuServe on-line services and will even alert you when a stock's price hits the level you've set. The package plugs into the electronic bill-paying service CheckFree and lets you manually import data from Prodigy's BillPay USA.

For anyone avoiding Windows-based personal finance software, Managing Your Money is an easy—and safe—choice. It may include everything except a direct line to your ATM machine, but you'll never feel overwhelmed.

▶FACT FILE

EDITORS' CHOICE Managing Your Money, Version 10.0

MECA Software Inc., 55 Walls Dr., P.O. Box 912, Fairfield, CT 06430-0912; 800-820-7457, 203-256-5000; fax, 800-944-6322.

Circle 458 on reader service card

Intuit Inc.

Quicken for DOS
Quicken for Windows

Intuit's Quicken products dominate the world of personal finance software for one good reason: They just keep getting better.

That steady evolution is evidenced by the two new Quickens: Quicken for DOS, Version 7.0, and Quicken for Windows, Version 3.0 ($69.95 each). The new Quickens feature an improved portfolio manager, a slick financial scheduling calendar, and scads of other enhancements to the deservedly acclaimed, easy-to-use core. Although they lack some of the specialized features found in other packages—notably built-in, on-line stock-price updating and sage financial advice—these are the strongest all-around electronic checkbooks.

SIMPATICO SOFTWARE

In all but a few details, these two packages share the same feature set. Still, the Windows version is generally easier to operate—thanks to the inherent strengths of its graphical interface. Also, an expanded CD-ROM version of Quicken for Windows (with Quicken Companion 2.0 for Windows, a database of stock quotes, and guides to financial markets, investments, and personal finance) will be available by the time you read this.

Each package gets you started by building a checking account, then shepherds you through all intricacies with QCards—context-sensitive help that you can easily disable. You can memorize transactions at will or use the QuickFill feature, which automatically finishes an entry as soon as it recognizes a payee from your keystrokes. But though a new loan setup links mortgage payments to the checkbook, the packages don't do much to help you create other account types—particularly complex investment accounts. The comprehensive documentation, however, helps you through setup procedures.

SUITABILITY TO TASK

Quicken for DOS

	POWER	EASE
Checkbook management	Excellent	Excellent
Budgeting	Excellent	Excellent
Tax and financial planning	Good	Good
Portfolio management	Good	Good
Electronic connections	Good	Good

SUITABILITY TO TASK

Quicken for Windows

	POWER	EASE
Checkbook management	Excellent	Excellent
Budgeting	Excellent	Excellent
Tax and financial planning	Good	Excellent
Portfolio management	Good	Excellent
Electronic connections	Good	Good

The new financial calendar is one of the most impressive additions, letting you quickly schedule one-time or recurring transactions. In the Windows version, you can even drag transactions from a list and deposit them on the calendar.

In portfolio management, the Quicken packages have almost caught up with Managing Your Money. Forms simplify basic jobs such as buying, reinvesting, and share splitting. And the Quicken pair can now deal directly with multiple lots of stocks. But the new Portfolio View screen in each contributes most to the newfound power, letting you instantly see your holdings, view their performance, watch price trends, and create investment-specific charts, graphs, and reports. Also, the $34.95 Quicken Companion 2.0 for Windows links to and updates from on-line stock and mutual-fund prices. Quicken for DOS lets you view stock prices in CompuServe and Prodigy, but you'll have to update prices manually.

Reporting and budgeting remain strong. Not only can you easily customize reports, but you can drill down through several levels in order to view specific transactions and build instant reports from any register or transaction. The products can create budgets from past information and even compare the financial events of any two periods you specify.

The packages still lack serious built-in tax planning and financial advice, and they rely on a handful of special-purpose calculators for the latter. But data from both Quicken products can be read directly by TurboTax for Windows and TurboTax for DOS.

Links to digital banking are as healthy as ever. The packages connect directly to CheckFree and let you manually import information from BillPay USA. The Quicken products can automatically categorize and log in the charges on your IntelliCharge credit-card statement and deliver electronic VISA credit-card statements via modem or disk.

If you want a taste of the future of on-line finances, keep in mind that nothing touches Quicken. In fact, for both basic and advanced levels of money management, these packages are hard to beat. They may not be sophisticated investment counselors like Managing Your Money, or as quick to start as Kiplinger's CA-Simply Money, but by maintaining ease of use and featuring even more capabilities, they have ratcheted up the standard yet another notch or two. □

▶FACT FILE

EDITORS' CHOICE Quicken for DOS, Version 7.0

EDITORS' CHOICE Quicken for Windows, Version 3.0

Intuit Inc., 155 Linfield Ave., P.O. Box 3014, Menlo Park, CA 94026-3014; 800-624-8742, 415-322-0573; fax, 415-322-1013.

Circle 459 on reader service card

THE DECISION FOR THE RIGHT SIDE OF YOUR BRAIN.

WordPerfect 6.0
for Windows
The latest version.

THE DECISION FOR THE LEFT SIDE OF YOUR BRAIN.

Lotus 1-2-3
for Windows R.4.0
The latest release.

THE DECISION THAT'S A NO-BRAINER.

The latest from Compaq DirectPlus:
The ProLinea 4/33s Total Solution Paq.
*$1,699 or $61 per month**

The Total Solution Paq includes the new Compaq ProLinea 4/33s with 4MB RAM, 120MB Hard Drive, a Compaq 1024 Color Monitor (1024 x 768 non-interlaced), a 2,400-bps Data+Fax Modem with WinFax Lite software, preinstalled MS-DOS 6, Microsoft Windows 3.1, WordPerfect 6.0 for Windows, Lotus 1-2-3 for Windows R.4.0, ReachOut Remote Control communications software, TabWorks and CompuServe.

Whether you work logically or intuitively, Compaq DirectPlus™ has the perfect answer to your computing needs.

A complete ready-to-use package, the Compaq ProLinea™ 4/33s Total Solution Paq™ combines the latest versions of WordPerfect and Lotus 1-2-3 with the latest version of our acclaimed ProLinea PC, the 4/33s. This high performance desktop is 30 percent faster than 486SX/25 machines, to handle word processing, spreadsheet and database applications with ease.

ProLinea 4/33s Features

- *33 MHz 486SX*
- *4MB RAM*
- *120MB Hard Drive*
- *3½" 1.44MB Diskette Drive*
- *Compaq Color Monitor*
- *Local Bus Video with 1MB Memory*
- *Preinstalled MS-DOS® 6 & Microsoft® Windows™ 3.1*
- *Compaq Mouse*
- *3-Year Warranty*

The Compaq Total Solution Paq also includes a 2,400-bps Data+Fax Modem that lets you send and receive directly, as well as access CompuServe.†† The Compaq ProLinea 4/33s is backed by our free 3-year warranty.† And a free technical assistance hotline is available every hour of every day.

intel inside

So don't wait. Get everything you need with one decision: call Compaq DirectPlus. And conserve your brainpower for the sort of thing that really requires it. Like running your business.

COMPAQ DirectPlus
1-800-888-5951
Weekdays 7-7, Sat 10-4 CST.
Ask for our new free catalog.

*Leasing is provided by GE Capital Services for a term of 36 months and is subject to approved credit and certain terms and conditions. Call for details. †Restrictions and exclusions apply. Monitors, battery packs and certain options are covered by a one-year warranty. ††CompuServe preinstalled with 30-day free trial membership ©1993 Compaq Computer Corporation. All rights reserved. Compaq and the Compaq Logo Registered U.S. Patent and Trademark Office. ProLinea is a trademark and Compaq DirectPlus and Solution Paq are service marks of Compaq Computer Corporation. Products, prices and programs are subject to change without notice. Other products are trademarks or registered trademarks of their respective companies. Microsoft and MS-DOS are registered trademarks and Windows is a trademark of Microsoft Corporation. The Intel Logo is a registered trademark of Intel Corporation. Offer available in the U.S. only.

If Networks Were Founded On The Idea That People Work Better Together, Why Install Modems That Work Apart?

It seems obvious, doesn't it? The better your modems work together, the better your LAN and your remote users will work together.

Simplify Your Network. Total Control™ is a modem pool that simplifies your network by integrating all your modems – and the functions of several other components – in one elegant chassis. And because Total Control is the only modem pool with an SNMP management system, you can monitor and test all of your network components from a single PC.

U.S. Robotics' renowned core modem technology is the foundation of Total Control's modem pool. Which means Total Control gives you exclusive features like QuickConnect™ and Adaptive Speed Leveling (ASL)™ – features designed for maximum throughput, minimized phone line costs and increased chassis utilization.

Your Data Will Be Safe, Too. Total Control's integrated security system is designed to keep hackers from getting into your network – and control who's dialing out.

It's not only the simplest, most powerful modem pool available now. It's a modem pool with the future built in. You can upgrade Total Control's modems to V.34 (28.8 Kbps) in minutes. And, when you're ready to go digital, Total Control can be easily reconfigured to accommodate T-1, ISDN and Switched 56K service.

Modems Work Better Together. Just like people. The people at U.S. Robotics are ready to work with *you* – to design the WAN solution that will help you be more productive, save you access costs, and put you in control. Total Control. For more information, call 1-800-USR CORP today.

TOTAL CONTROL Now With SNMP

U.S. Robotics
The Intelligent Choice in Data Communications

1-800- USR CORP

CIRCLE 920 ON READER SERVICE CARD

U.S. Robotics and the U.S. Robotics logo are registered trademarks of U.S. Robotics, Inc. Total Control, QuickConnect and ASL (Adaptive Speed Leveling) are trademarks of U.S. Robotics.

STACKABLE HUBS

A Hub Above

Has your network expanded—*again?* And you need more flexibility than a standalone hub can offer? You need stackable hubs, which can be connected and managed.

by Jeffrey L. Carrell

Chances are you've already been dealing with a hub or two on your Ethernet LAN for some time. Chances also are that your network has expanded—so that you need even more hub capacity today or you will soon. Maybe you've got to connect a number of small independent networks together? Chances are that the hubs you've got are standalone "dumb" hubs that were attractive when you bought them, because they were very inexpensive and did the simple concentrator job you needed done at the time. But chances are it's time for you to move up to stackable hubs for their flexibility and manageability.

A *hub* is simply a multiport signal repeater or concentrator—necessary equipment for any Ethernet LAN that is built on 10BaseT (unshielded twisted-pair) cabling. (See "How Hubs

IN THIS REVIEW

Accton EtherHub-12i 254
AsantéHub 1012 255
Cabletron SEH-24 259
Cameo UltraHub 1000 261
Compex TP3000 262
D-Link DE-1200 265
HP EtherTwist Hub/12 265
Intellicom SP-HUB/B 270
NetWorth Series 3000 TriSegment Stackable Hub 274
SMC Elite 3812TP 275
SynOptics LattisHub 2803 276
Editors' Choice 249
Suitability to Task 254
Summary of Features 258

Photography by Robert Cardin

Work.") And that's pretty much all the low-end standalone hub does. It doesn't need to be managed.

Stackable hubs can be cabled together to solve larger networking challenges. And even if you haven't been doing some kind of network management before now, if you're thinking about adding more infrastructure devices such as these, you're into territory in which you'll need to manage these new devices. Because . . . chances are your network has become not only larger, but more complex—and even more important to your company's operations. You can't afford not to manage it.

In this roundup, we've reviewed stackable hub solutions from 11 vendors that include the hubs themselves and management software or hardware. You can buy the entire setup with management up front, and in most cases, you'll save lots of money by doing so. Or you can add it later after you've got a couple of the things installed, and then you realize you've got to manage them. We reviewed hubs and software from Accton Technology Corp., Asanté Technologies, Cabletron Systems, Cameo Communications, Compex, D-Link Systems, Hewlett-Packard Co., Intellicom, NetWorth, Standard Microsystems Corp., and SynOptics Communications.

We asked each vendor to send us equipment to support a configuration of 60 ports (and we received a range of solu-

How Hubs Work

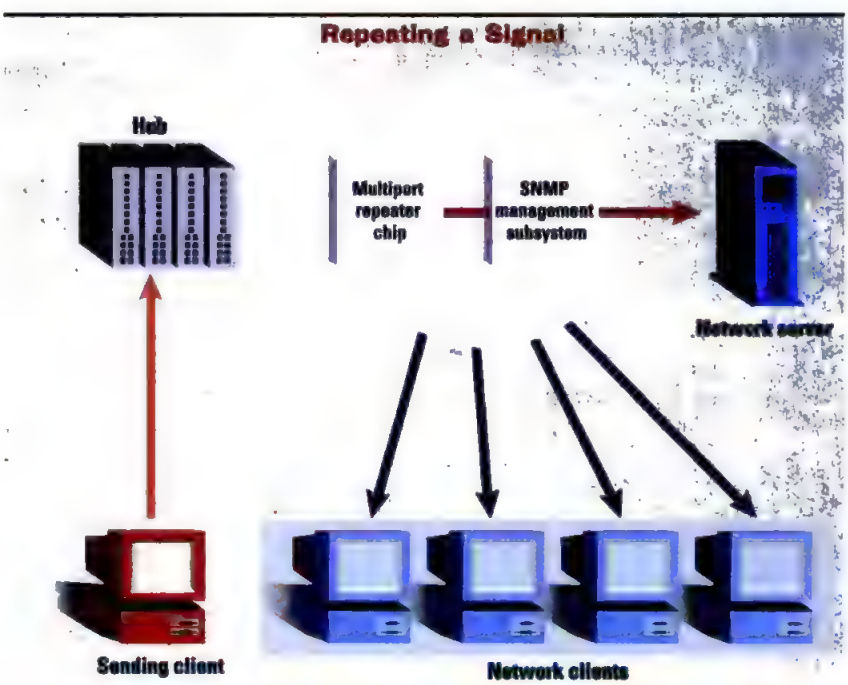
Hubs are at the heart of your 10BaseT Ethernet network. Required by the 10BaseT specifications, hubs, also called concentrators or multiport repeaters, are well named as they are the central point of connection for each of the unshielded twisted-pair (UTP) cables coming from your network clients and servers. Usually the hubs are hidden in dark wiring closets, but here we shed some light on these important network devices.

To understand hubs, you need to understand a bit about Ethernet. Each Ethernet packet is composed of control information (overhead) and data. The control information includes the destination and source Ethernet address. Each Ethernet card sold has its own unique address burned into ROM.

To illustrate how a hub works, let's follow one Ethernet packet from a network client to a network server, both attached to the same hub. The packet travels out of the client Ethernet card through the UTP wire into the central hub. If the sending card detects no collision—recognized through voltage on its receiving wires—then the hub takes over. Inside the hub, the packet enters a multiport repeater chip where it is electrically regenerated (repeated) and *broadcast* to every other port. On a 12-port hub the packet would be sent to the other 11 ports. In our example, the network server's Ethernet card would recognize the packet's destination address as its own and therefore accept the packet. All other Ethernet cards on the network would drop the packet after reading its destination address. In essence, all the hub does is repeat the packet to all ports, never reading any of the packet's control information. This illustrates the simplicity of hubs.

Stackable hubs are connected, creating a virtual bus or backplane where every port in the stack behaves as if it were on the same hub. For example, for four stacked hubs of 12 ports each, a packet coming in 1 port would be repeated out the other 47 ports.

SNMP (Simple Network Management Protocol) is generally implemented by installing a separate daughterboard on a hub's motherboard. Thus, the multiport repeater chip mentioned above not only broadcasts packets throughout the hub, but also tags each packet and sends a copy to the SNMP daughterboard for statistics gathering and analysis.



tions from 48 to 80 ports), along with its SNMP (Simple Network Management Protocol) management software module based on a DOS/Microsoft Windows platform. Specifically, we considered the ease of upgrading to hub/network management as an add-on, design (from a practical wiring standpoint), and cost per port. (See "How We Tested.")

HUB HIERARCHIES

In the larger realm of hubs, *stackable hubs* are smaller units (usually with 12 ports) that can be connected together to form workgroup or departmental networks. Although the lines are not clearly defined, the stackable hub falls somewhere between the standalone hub at the low end and the chassis-based enterprise hub at the high end.

Standalone hubs are the most inexpensive, but they have little functionality and usually no upgrade or expansion capability; they generally are not manageable. Stackable hubs have more functionality and flexibility, and cost somewhat more; they are expandable and physically modular. Enterprise hubs are the most complex and the most expensive. They are generally modular in that all the functions you want in the hub require a certain type of module to be installed, adding up in many cases to a very complex device.

Enterprise hubs can provide such functions as support for multiple network topologies, bridging, routing, and wide-area links between networks. Very few stackable hubs offer such features, although a few have options for bridging (such as some of the new hub offerings from Cabletron). Each of the hubs in this roundup supports only one topology, Ethernet. Enterprise hubs also can have more than 100 ports on a single chassis while the stackable usually has 12 (exceptions are NetWorth and Cabletron, both of which have 24). Thus, another principal difference is that enterprise hubs can have multiple segments on one chassis.

Among managers of networks in the 20- to 50-node range (who are most likely to look to a stacked-hub solution), most must spend their budgeted dollars carefully (although this probably follows for managers of all size networks). Moreover, it is always a challenge to argue for buying more new technology—buying ahead, that is. When what your boss sees is a network already in place that is working, it can be difficult to make the case for buying "new technology" that could make an impact or buying "more" initially. Several of these vendors help you make the case by offering a better deal when you buy your management solution up front. But you must build the case on other issues as well, such as performance, reliability, and troubleshooting concerns.

Some stackable hub systems, such as those from Asanté and D-Link, offer a solution that combines the best of both standalone and stackable. They offer you the opportunity to start with simple, unmanaged hubs, then you add another hub unit that has management built-in. This hub then manages the other stackable hubs as one network.

PC MAGAZINE

EDITORS' CHOICE

- **AsantéHub 1012**
- **LattisHub 2803**

In naming our Editors' Choices we focused on hub design, management software, and the upgrade process—whether accomplished by software, hardware, or a combination—and value. Both of the stackable hub solutions that we've recognized here fall at the high end of this market, and certainly of this roundup. The high end was where we found products that open up possibilities—that don't limit a network manager who is shopping here to find expandability, flexibility, and help in managing a growing, changing network.

Both Asanté Technologies and SynOptics Communications offer superior stackable hub solutions—SynOptics at a lower price per port in the tested configuration—but both are well worth the money. There are no gotchas in either one of these, something not all our tested setups can boast. These vendors are established companies with good support mechanisms.

The AsantéHub 1012 has a fine design with many well-positioned LEDs. And one of its big advantages is its flexibility: It comes with 12 RJ-45 connectors, as well as a 50-pin Telco connector to allow use in a standard wiring closet or rack.

Asanté's three-in-one link provides redundant backbone connectivity or simply the flexibility to choose 10BaseT, coaxial cable, or fiber optic cable. The AsantéView software is very mature and easy to use but powerful. Its superior map editor includes hierarchical mapping, and it offers such security features as password protection and node-intrusion alert. Another of the AsantéHub's particular strengths is that everything in the package is not only well-designed but well-executed.

We found the SynOptics hub and software combination to be also extremely well-designed and well-executed. The 16-port LattisHub 2803 has good diagnostic LEDs and was the best-designed hardware in the group. The Optivity 1.0 management software is quite powerful and feature-rich. It might be more application than some want, but it is built for growth—something that network managers should always be thinking about.

Some also might consider it a drawback that the SNMP-enabled LattisHub 2813 must be used to manage the other hubs, but we considered this simply another approach and one that SynOptics has made to work quite well. The tested SynOptics configuration also was a winner in our price-per-port calculation—especially considering the power its software delivers and the fine design of its hubs.

Managing your network becomes more difficult as it grows, but network management as a whole is getting easier and cheaper. Even so, not all "manageable" devices such as hubs, file servers, and other network devices can always be managed by the same console or software. A rule of thumb: Look for management features that use a standard network management application platform.

FLEXING HUBS

Among the issues you should consider in the purchase of infrastructure devices such as these, flexibility is key. How flexible is the overall configuration on the hub? For example, what does it take to expand the stack in order to add more ports or even to add network management. How easy is it to access the hub connectors when performing these tasks? Do you have to bring down the entire network just to expand the number of ports or to add the network management? Another concern is how closely the connectors are situated.

Some hubs give you higher port and connector density (up to 24 on a few), but it can be difficult to get to all of the connectors, because they are too close together, a situation that makes cabling a nightmare. Cameo's UltraHub 1000's port layout was particularly cramped.

Also consider the functionality you need at the high end. If, for example, you need the device to support multiple topologies, routing, or wide-area links, then you should be considering an enterprise hub. You could buy a stackable hub plus all of the other components necessary for such a system, but it will end up being more expensive to put together—and it might never feel as integrated as the enterprise hub. If you have multiple sites to network together, it might be better to get an enterprise hub for the central site and stackable hubs for the remote sites.

There's no question that upgrading infrastructure is one of the most painful aspects of managing a network. Sometimes you actually have to bring the network down to do the upgrade, with all the productivity and scheduling inconveniences that implies. In addition, some products are simply difficult to upgrade because of their physical design. On a hub, you may have to disconnect all cables completely, remove the hub from the stack, and disassemble it in order to upgrade it. The vendors represented here either add daughterboards to one hub or to all hubs in the stack; Accton, Cabletron, Compex, Intellicom, and SynOptics all require a separate standalone unit (with or without ports).

If all you need to do is add more ports to your stack, it may be as easy as adding another stackable hub or two and interconnecting them using either special ports or a couple of your node ports. Sometimes, however, you have to set switches for hub placement in the stack or for termination of the first or last hub in the stack, in order for the hubs to work properly. The best case, in expanding your stack, is when the hubs can recognize for themselves where they are in the stack (as SynOptics' LattisHub does) and self-terminate when necessary. It means less work on your part, and, equally important, less chance of error.

For upgrading your stack to network management, a couple of hardware options are available. The most common approach among the vendors in this review is for you to add a stackable hub that either already has the management features in it or has a hardware upgrade module that has the management on it and can manage the entire stack. Some vendors sell a dedicated box that only has the management features and can manage the entire stack, but this piece of equipment offers no ports or other capabilities in it.

Note here that when you are adding the network management capability, that some management applications take a particular "view" of the stack—how the hubs are displayed in the views on the management console. Some hub views show the management hub specif-

HIGHLIGHTS

Stackable Hubs

STACKABLE HUBS are a good compromise between the limitations (but low cost) of the standalone hub and the expense (albeit with associated modularity, flexibility, and many features) of the enterprise hub. Stackable hubs go beyond signal repeating; they can also be cabled together to form larger segments of your network. In addition, they can be managed through the addition of network management software.

WE REVIEWED stackable hubs and network management software for Ethernet networks running 10BaseT from 11 vendors. Some of the hubs are well designed, some are not. Most have acceptable network management software, but you should look for a package based on either Hewlett-Packard's OpenView or Novell's NetWare Management System (NMS), two open platforms that support the de facto Simple Network Management Protocol (SNMP) standard. Packages based on an open standard deliver the more robust features you need, and enable you to integrate with other network management packages that are based on the same standard.

YOUR BEST BUY in stackable hubs overall is to purchase your hubs (even if it means a few more ports than you need at the moment) with management included up front. You'll find this to be more economical than buying the hardware individually and then adding management at a later time. Most of the vendors represented in this roundup have structured their pricing to reward those who plan management up front.

THESE VENDORS each approach the process of adding the network management software differently. Some add it in a separately sold hub with ports, others build it into a daughterboard that gets added to a hub you already have, and a few handle it in a separate box (without ports). Each method has trade-offs.

Connecting Your Notebook To The LAN Does Take A Little Time.

In just seconds, Xircom can connect any notebook to any LAN anywhere. Simply plug a Xircom Pocket LAN Adapter into your parallel port or slide a Xircom CreditCard LAN Adapter into your notebook PCMCIA slot.

New! Combination Ethernet LAN adapter and 14Kbps data/fax modem now available.

That's it. There are no tools, batteries or AC adapters required.

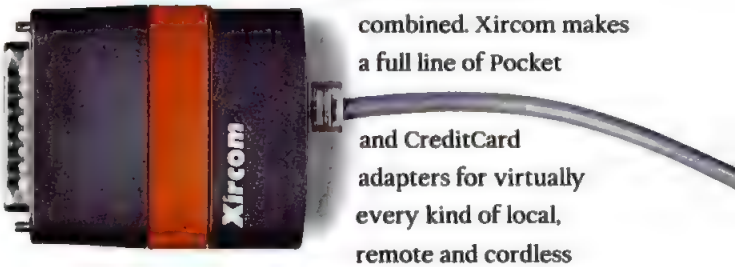
It's this easy plug-and-play simplicity that's made Xircom the world leader in notebook connectivity. With more notebooks connected to more LANs than all others combined. Xircom makes a full line of Pocket and CreditCard adapters for virtually every kind of local, remote and cordless notebook-to-LAN connection.

All backed by a two-year warranty and a lifetime, half-price upgrade policy.

Call 1-800-874-7875 ext. 25B for the name of a Xircom dealer near you. And get your notebook on the LAN.

Fast.

3.6 Seconds To Be Exact.



Xircom

The easiest way to go from notebook to network.

Xircom U.S. Headquarters: 818-878-7600.
Xircom Europe NV +32/(0) 3 326 34 94.
Xircom Asia 011-852-525-2078 ©1993 Xircom, Inc.

CIRCLE 211 ON READER SERVICE CARD

ically on the top or bottom. You should match the actual physical placement of the hubs with the network management console's view. Be sure that they look the same: Should you ever be in serious troubleshooting mode, you don't want to be contending with a logical view and physical view that are different and confusing.

HUB READINGS

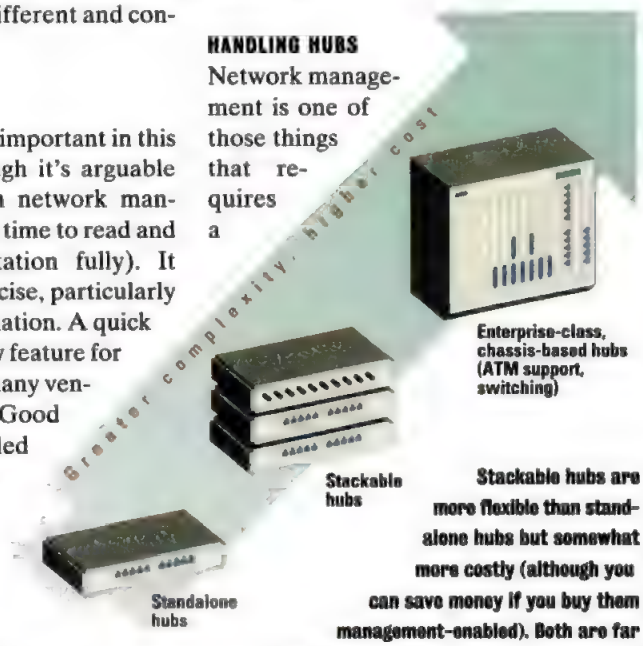
Good documentation is important in this product set (even though it's arguable how many users—even network managers—actually take the time to read and analyze the documentation fully). It should be clear and concise, particularly in its treatment of installation. A quick reference card is a handy feature for any product, although many vendors do not offer one. Good screen shots and detailed configuration file listings also help.

Some vendors also require you to purchase additional third-party products in order for all their products to work (usually you have to add a TCP/IP stack to your IPX network through the console computer or the actual network management application). But the vendors do not always assist in integrating all of these components together in their manuals. It pays to take a good look at the documentation in those cases. As long as it seems complete and accurate, it almost does not matter how much of it there is or what format it comes in. Some vendors, for example, supply lots of smaller manuals with a detailed index. Some manuals have very little weight to them, but are complete enough that you can sail through an installation with no problems (as was the case with Standard Microsystems' SMC Elite 3812TP line). Your best bet is to review a product's documentation before you buy. If you feel that it is complete, you shouldn't have many problems in installation and maintenance.

We noted that for a few of these hub solutions, the Compex TP3000, for one, the documentation was not always consistent with the products we had in our hands to review. Although you cannot guard against this completely, we pointed out these instances in the individual reviews, and you should always take the vendor to task when you uncover such a situation.

HANDLING HUBS

Network management is one of those things that requires a lot of initial setup and configuration time, but can save you lots of time and late-night agony in troubleshooting, and also can assist in preventive maintenance network analysis. One key feature to look for here is what network management platform a stackable hub management application runs on.



Stackable hubs are more flexible than standalone hubs but somewhat more costly (although you can save money if you buy them management-enabled). Both are far less expensive than enterprise-class hubs.

The two most widely used network management platforms for DOS (and Windows) systems are Hewlett-Packard's HP OpenView/Windows and Novell's NetWare Management System (NMS). Although HP OpenView/Windows has been around since 1988, Novell's product, which was introduced in 1992, is also making its presence known. NMS is enjoying the same broad third-party support as the rest of Novell's networking software.

Both OpenView and NMS offer the flexibility for managing not only hubs, but other network devices such as file and print servers. Moreover, both of these platforms support the Simple Network Management Protocol (SNMP), a set of guidelines that define form and content for all management functions, including management communications and traffic to auto-partitioning and alerts.

SNMP is the de facto industry standard for network management functions, even for small networks. SNMP communications between managed devices and the management consoles generally are handled over TCP/IP, but Novell's IPX is also supported by both OpenView and, of course, NMS.

Within the broader area of network management, a couple of features are particularly desirable for this product set. Besides SNMP support, auto-discover of devices, either by the network management platform or the hub application, is important. Also key are a mapping editor, a real-time physical view of the hubs panel and LED status, and logging of events and errors. Also gaining popularity are auto-partitioning and out-of-band management. And one of the critical features of all network management is the alert capability.

Alert monitoring is a very broad area. Some managers want to know when a node comes on or leaves the network, some want to know only when key devices leave the network. And how do the management modules with these packages alert you to trouble? Some applications only alert you via the console screen. Although they may show that a device has a problem by either flashing an icon or changing its color, they may not provide an easy way to view the affected area of the network.

Some applications can update a log file, which allows you to watch trends as well as track a history of the network. The types of alerts that you want to see are up to you. In management applications

Our Contributors: JEFFREY L. CARRELL is a senior communications systems engineer for a large transportation company. GERARD A. PALMERI is a project leader at ZD Labs and acted as the project leader for this roundup. DAVID GREENFIELD is the senior editor for networking, ANDREW C. KANTOR is a staff editor, and ADAM A. HICKS is an editorial researcher at *PC Magazine*. GAIL SHAFFER was the associate editor in charge of this story.

ZD Labs Evaluation Procedures: Stackable Hubs

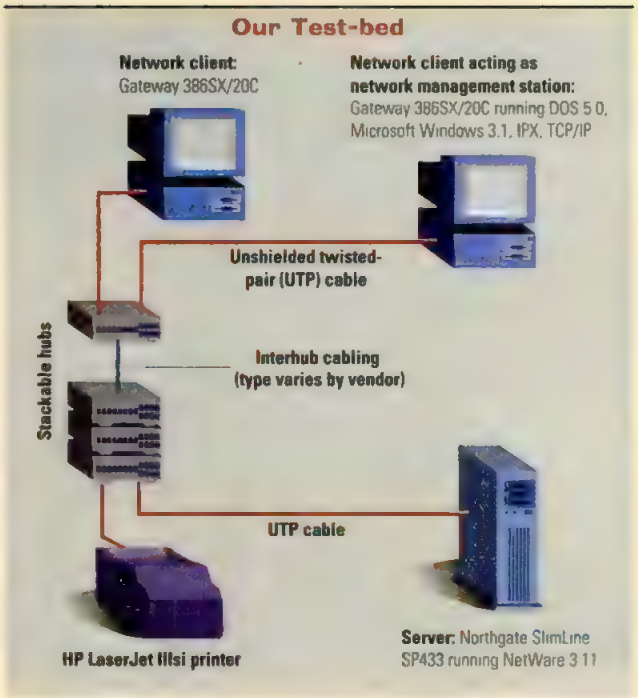
In evaluating these hubs, we focused on design, management features, SNMP upgrade, and value. We didn't run performance tests—all of these hubs are based on similar multiport repeater circuitry, and performance was not an issue.

How We Tested

In our evaluation of stackable hubs, we were looking for a combination of good physical design, robust network management, and a well-devised upgrade path to that management. Considerations for physical design included the cabling arrangement, port density, number of hubs that could be stacked, LED indicators, and power supply, among other factors. In the network management area, in addition to support for SNMP (Simple Network Management Protocol), we were looking at such features as auto-discover, mapping editor, and alert mechanisms. Equally important, we evaluated the move to management; that is, how easy or difficult it was in each case to add either the managed hub or the hardware/software modules that delivered the management component to a stack of hubs. Ease of installation and upgrade were also considered important.

Each vendor was requested to send us hardware and software to support a 60-port configuration. We received a range of solutions, some elegant and feature-rich, some not.

At ZD Labs, we tested each hub stack using a 486/33-based Northgate SlimLine SP433 system with 8MB of RAM configured as a NetWare 3.11 server. The file server and the client PCs were connected to the hub stack. The clients were Gateway 386SX/20C systems using Eagle NE2000 Ethernet network interface cards. One of the client PCs was designated to test the software—the SNMP-compliant network management package supplied by each vendor with each hub stack. We assembled each hub stack according to the vendor's installation procedures, then upgraded to the SNMP management and evaluated that process. Finally, we installed the network management software based on documentation supplied by the vendor and appraised the software's performance.



based on SNMP, alert functions are customizable. But beware: The more monitoring you do, the more traffic you add—just for network management. It may, however, be worthwhile to you.

Another alert feature, not implemented by many vendors yet, is alert by pager. Paging technology is evolving quickly, and not all pagers work the same way. Nevertheless, many network administrators have begun to carry pagers as more and more PC-based LANs take on mission critical applications. A couple of the products reviewed offer pager alerting, but are very limited in the function. Some only support SkyPager, and some only offer alerts for a "hub down" condition—Asanté supports such an alert. This certainly is an area that vendors will be expanding in the next few years.

With a good network management strategy in place, chances are you'll also be able to spot trouble areas in your network before they become real problems. You can capture performance and trend data, analyze it (via a spreadsheet, custom analyzer included with the network management application, or real-time graphs) and decide what, if any, changes should be made to your network.

You may decide, for example, that you should divide your network into smaller segments for better performance to each workgroup. NetWorth's Series 3000 Tri-Segment Stackable Hubs have segmenting built-in, with each hub supporting three eight-port segments. Or perhaps some network interface cards (NICs) are causing congestion and multiple retries to or from other devices. They may be slowing down the overall performance of the network—but perhaps not enough to trigger an alert.

Auto-partitioning, in which the hub automatically partitions off a port or ports, is also becoming a popular feature. In the NIC example, if the problem gets to be too large, the hub auto-partitions off the offending ports, thereby removing the problem NIC from the network, all without your intervention.

Remote network monitoring and management, or *out-of-band* management, is another growing area. Out-of-band management uses a connection to the hub via a serial connection, either through a modem attached to the hub or via a connection directly from the hub to the management console. Polling of a network remotely is not as accurate or complete as real-time polling, but you can get basic status information. Not all network management applications offer good out-of-band functions, but most are improving.

Good documentation is important in installation and setup for the software that works with these hubs. If you're still getting accustomed to running an expanding network, it probably will take you some extra time to set up your net-

work management software. Also, for some of these products—although they do not directly "require" you to dedicate a computer to that one task—that's essentially what ends up happening. In a small system, you may not have that luxury. Keep this in mind as you select stackable hubs and network management for them.

HAVE A HUB

Most people involved in running a network these days *are* dedicated to that task. Fading away are the days of "network managers" who maintain the company network "in their spare time." Giving network managers a chance to develop a specialized knowledge base, and keeping a network operating at its peak requires the dedication of both time and people resources. It must come from either internal resources or from outside, most likely in the form of a network consultant. But even if you work with a consultant, you must stay informed to better convey to the outside firm how you perceive your needs against what you know of the market.

The hub market is itself changing and growing rapidly. For example, many enterprise hub vendors—such as SynOptics and Cabletron—now offer stackable hubs as well. The challenge for those vendors in this product set is to provide the scaled-down hardware and software to an audience that may not be as experienced—or need to be—as the audience for their enterprise models. The opposite is true for the standalone hub vendors who venture into the stackable-class product lines.

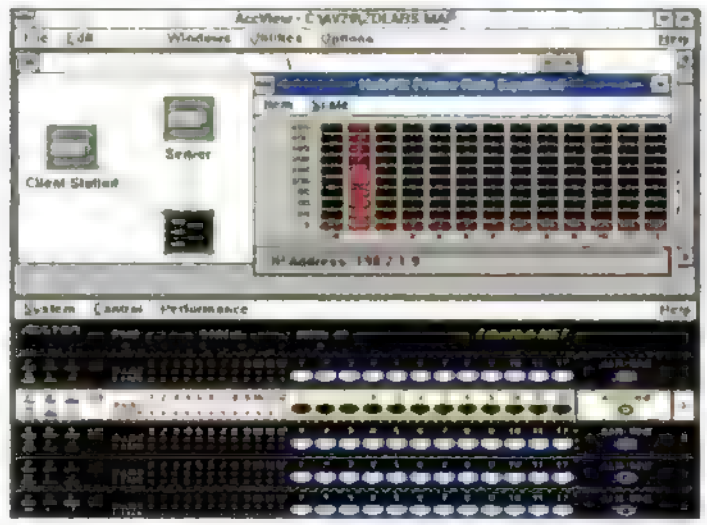
All of this leaves the network manager with a lot of gray areas to negotiate. You must keep focused on the functionality you need today—and be willing at least to guess at what you'll need tomorrow—and you must be willing to compare actual "solutions" offered by vendors in place of shopping just for products and rock-bottom prices. Chances are, one of these stackable hub solutions is just right for you.

Accton Technology Corp.

EtherHub-12i

BY JEFFREY L. CARRELL

Accton Technology Corp.'s EtherHub-12i, part of the EtherHub 1000 family, combines with the EtherHub-MGT management units to let you stack more hubs and have more total ports than do most of the other offerings in this roundup. Each EtherHub-12i has 12 ports for RJ-45 con-



AccView is not based on an open network management platform but is rich in features.

Suitability to Task: Stackable Hubs

Stackable hubs, like many networking products, are a combination of hardware and software that you add to your established network to address a certain situation or to solve a problem. In the case of these products, the goal is to reinforce Ethernet signaling and to give you flexibility in segmenting and managing your network. Particularly at this level, the solution you're purchasing to address a problem shouldn't introduce any problems of its own. The components of a stackable hub solution should be well designed, well integrated, well priced, and reasonably easy to work with.

Hub design A well-thought-out design that takes into consideration how a device will actually be used is generally reflected in the final product. A good design saves a network manager considerable time and trouble. For stackable hubs, a good physical design incorporates all available means to minimize the amount of cabling necessary. This includes the cabling for electrical power, hub interconnection (cascading), hub management, and, of course, the network connections to the RJ-45 ports. Also important here was whether vendors used appropriate, up-to-date technology in all design elements: no power bricks allowed. Any extras that are built into the hub, such as readable, well-placed diagnostic LED indicators, contributed to a better rating overall.

SUITABILITY TO TASK

Product Name

	POOR	FAIR	GOOD	EXCELLENT
Hub design	●	○	○	○
Network management	●	●	○	○
Ease of SNMP upgrade	●	●	●	○
Value for the price	●	●	●	●

Network management The stackable hubs' network management software should be based on one of the standard network management platforms such as Hewlett-Packard's HP OpenView or Novell's NetWare Management Service (NMS), both of which support SNMP (Simple Network Management Protocol). The software should be easy to use: The icons should quite obviously represent the devices they are meant to signify, and the views should be scalable and easily navigable. Icons should also display information efficiently. And a view of the hub front panel should be available.

Ease of SNMP upgrade The process of upgrading to SNMP management should not be difficult. In the easiest approach, all the network manager would need to do would be to run an install program that would automatically edit the necessary configuration files. Also acceptable would be a daughterboard that could be easily installed in the field. Packages that required the user to perform configuration beyond a reasonable expectation were downgraded (unless they provided exemplary documentation for the procedures). We also considered it a negative if you need to dedicate a system outright to hub management, or if the management portion must be purchased as a full-chassis module that does not otherwise function as a hub.

Value for the price These stackable hubs are a step up from low-end, quite limited standalone hubs—which, of course, are also cheaper. But even though it is reasonable for them to cost more, stackable hubs should offer network managers an affordable solution for expanding and managing their growing networks. We considered the price per port for each solution, which we calculated using the prices for the hardware and software that vendors sent for the 60-port configuration we tested. We weighed this against design, features, flexibility, and other factors listed above.

nectors for twisted-pair cabling, plus the ability to cascade up to 14 hubs for a total of 168 ports (although you probably don't want to use more than 70 or 80). Each of the hubs also comes with built-in SNMP (Simple Network Management Protocol).

The EtherHub-12i's LEDs provide clear indicatorsin many areas including collision, jabber lock-up, link status, partition status, network traffic, network monitor, power, and terminator enabled. You can also see information on AUI and BNC port partitioning.

SUITABILITY TO TASK

EtherHub-12i

	POOR	FAIR	GOOD	EXCELLENT
Hub design	●	●	●	○
Network management	●	●	○	○
Ease of SNMP upgrade	●	●	○	○
Value for the price	●	●	○	○

Accton's method of stacking and managing its hubs is somewhat unusual, and requires a slightly greater expenditure of time and money than do most other vendors' configurations. For example, to cascade the hubs, you need to set a terminating switch on the end hubs to On and set a switch on all the others to Off. This is not the usual case for stackable hubs; most often the hub is smart enough to know whether it is a terminator.

In order to upgrade to a managed network, you add the EtherHub-MGT hub to the stack of SNMP-ready EtherHub-12i hubs. Unlike some other products, however, adding a management unit to the stack does not add any ports to the total configuration. The EtherHub-MGT provides management, but nothing else. (The EtherHub-12Mi ($1,199) should be released by the time you read this; Accton plans to have management built into this unit. This addition to the Accton line of hubs will make a managed 60-port configuration slightly less expensive.)

Accton's documentation can stand some improvement. Although the installation section of the manual for the hubs is complete, the procedure for installing AccView, the network management software included with the EtherHub-MGT, is not. For example, you must manually configure Accton's supplied TCP/IP driver to work with your Ethernet board, but that fact is not made clear. (The driver does not work for any other functions, and it is not supported by many network interface cards, bringing its usefulness in question.)

Although AccView is not based on any network management application such as Novell's NetWare Management System (NMS) or HP OpenView/Windows, it does provide most of the features you would want, including auto-discover, trap and event managers, statistics on the port or hub level, isolate ports or hubs, set thresholds, and an MIB (management information base) browser. Surprisingly, Accton recommends using a 486/50-based computer to run the software, which means dedicating a high-end machine just to manage your hubs.

Although the EtherHub-12i can provide more ports than most of the other products in this roundup, its nonstandard management system and proprietary management software take away some of the product's luster.

FACT FILE

EtherHub-12i

Accton Technology Corp., 1962 Zanker Rd., San Jose, CA 95112; 800-926-9288, 408-452-8900; fax, 408-452-8988

List price (tested configuration): Hardware: five EtherHub-12i hubs, $699 each; one EtherHub-MGT hub, $599. Total hardware price: $4,094. Total number of ports: 60. Price per port: $68 Software: AccView, included with EtherHub-MGT.

In short: Able to provide more ports than most of the other products here—168 through cascading—the EtherHub-12i does require a little extra effort in configuration But its LEDs are first-rate, and the EtherHub-MGT offers all the management features you might want (although Accton recommends using a 486/50 to run it, and it is not based on HP OpenView or Novell's NMS). In its favor, Accton's products are among the most inexpensive in this roundup

478 ON READER SERVICE CARD

Asanté Technologies Inc.

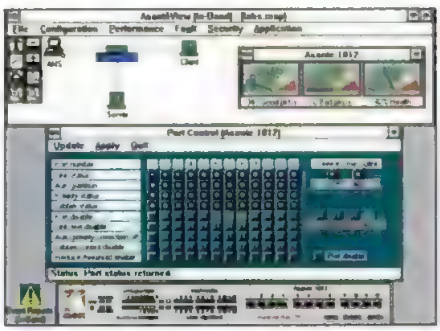
AsantéHub 1012

BY JEFFREY L. CARRELL

The AsantéHub 1012 provides some hardware features normally found only in larger departmental or enterprise hubs. You also can add software that will give you some network management capabilities not normally found even in a dedicated management application. This power explains a price that is higher than most in this field: $1,299 each for a 12-port unmanaged hub, or $1,499 for each managed version.

The AsantéHub's front panel has 12 RJ-45 connectors; you can also connect your nodes via an RJ-21 Telco connector on the rear, which permits a cleaner cabling solution, because it makes both sides of the hub available for the wiring. The front of the hub has a utilization display, with link and receive LEDs for each of the 12 ports, as well as indicators for percentage of collisions, power, SNMP management, misaligned/CRC, runts/fragments, late collisions, and short events. These last few LEDs provide a great deal of assistance during troubleshooting.

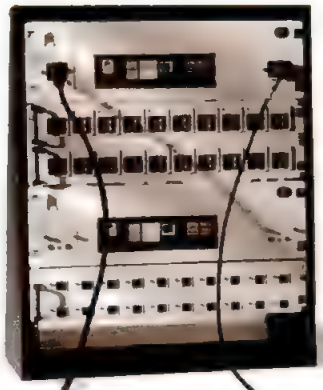
For connecting the hubs, Asanté Technologies' three-in-one port (unique among the hubs in this roundup) lets you use an RJ-45, BNC, or AUI connector, allowing flexible cabling options. When you are managing via out-of-band connection from a PC, you can use either an RS-232 or RJ-45 connector; Asanté supplies the cables needed for connecting to the RJ-45 from the serial port. And, in addition, Asanté allows you to check every hub in the group with a single call from a modem, rather than having to call each unit separately—a feature some other systems do not offer.



The advanced AsantéView software can send a "hub down" alert to a SkyPager device.

The AsantéHub can be purchased with or without SNMP management capability. However, you'll save about a thou-

We're talking hot technology here. Very hot. In fact, the IBM hubs offer so many striking features and attractive benefits, they're practically irresistible. Take the 8250 Multiprotocol Intelligent Hubs, for example. For any company trying to integrate a complex combination of local or remote Token-Ring, Ethernet or FDDI LANs, it's sure to be love at first sight.



IBM 8230 Controlled Access Unit (connects up to 80 Token-Ring devices at 16Mbps or 1Mbps, flexible lobe attachment modules, automatic recovery)

Hubba

The 8250 hubs are engineered around a unique, feature-rich backplane design offering

Strategic Hub Solutions from IBM

high port density and software reconfiguration. Flexible media modules are provided. And remote hardware and software network management from one simple location is available with the AIX® NetView® Hub Management Program/6000.

But with the 8250 hubs, beauty is more than skin deep. Especially when you consider the cost of ownership. Not just in terms of the immediate price and per-port cost efficiencies, but also in

IBM 8250 Multiprotocol Intelligent Hubs (6-slot/17-slot models, connect a combination of multiple Token-Ring, Ethernet and FDDI networks, slot independence, hot pluggability, port switching, fault tolerance, redundancy and comprehensive management)

IBM 8228 Token-Ring Multistation Access Unit (cost-effective, 8 ports, cascading)

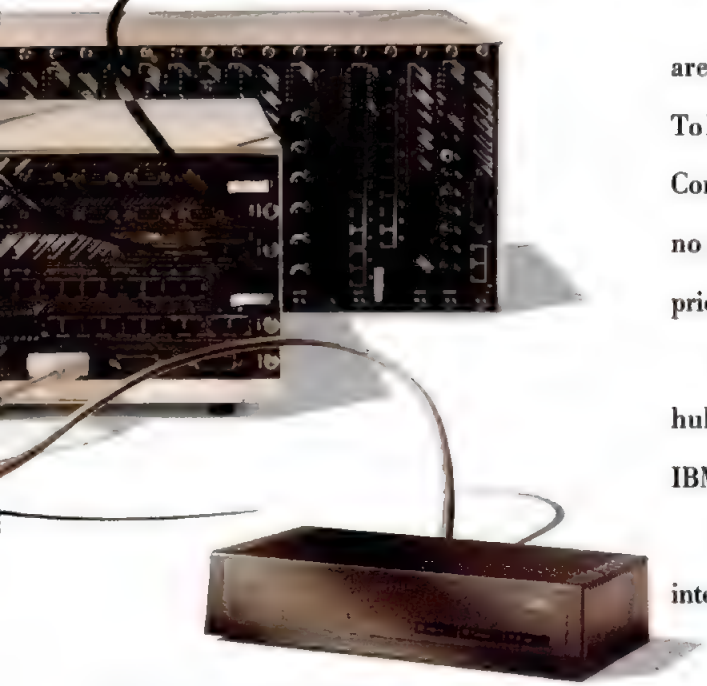
IBM, AIX and NetView are registered trademarks of International Business Machines Corporation ©1993 IBM Corp

IBM 8240 FDDI Concentrator (links up to 24 users with fiber or copper, hot pluggability)

terms of long-range operational savings. The strategic features of the 8250 hubs mean improved productivity. Fewer trips to the wiring closet. Less downtime. Remote control. Flexibility to grow. And, of course, the kind of reliability and service that only IBM can provide.

Now if you're considering Token-Ring or Ethernet LANs, the 8228 MAU and the 8222 hub

hubba.



IBM 8222 6-Port 10BaseT Workgroup Hub (AUI port cascades for added connectivity, LED diagnostics, full 802.3 compliance)

are simple, cost-effective solutions. The 8230 Token-Ring CAU and the 8240 FDDI Concentrator provide enhanced flexibility. And no one offers a broader array of attractively priced LAN adapters than IBM.

For more information about IBM's family of hubs or to order, just give us a call at 1 800 IBM-CALL, ext. S82D.

The IBM hubs. Discover just how appealing interoperability can be.

Making networks work

IBM

▶ SUMMARY OF FEATURES

Stackable Hubs

In alphabetical order by company

For pricing breakdown, see Fact Files.

■ = YES □ = NO

	Accton EtherHub-12i	AsantéHub 1012 (PC MAGAZINE EDITORS' CHOICE)	Cabletron SEH-24	Cameo UltraHub 1000	Compex TP3000	D-Link DE-1200	HP EtherTwist Hub/12	Intellicom SP-HUB/B
Physical Characteristics								
Dimensions (HWD, in inches)	1.8 x 17 x 9.8	2.3 x 16 x 10.3	3.1 x 17 x 8	1.8 x 17.8 x 8	1.5 x 8 x 6.5	1.8 x 17.5 x 8.3	1.8 x 16.8 x 9.3	1.5 x 17.3 x 8.5
Number of RJ-45 ports	12	12	24	12	6	12	12	12
Location of RJ-45 ports	Front	Front	Front	Front	Front	Front	Back	Back
Maximum number of managed hubs per stack	14	10	5	5	4	5	30	5
Maximum number of ports per hub stack	168	120	130	60	28	60	360	65
Mounting equipment included	■	■	■	■	■	■	■	■
LED Indicators								
Collision LED/Power LED	■■	■■	■■	■■	■■	■■	■■	■■
Utilization LED	□	■	□	□	□	■	□	□
Link LED for each port	■	■	■	■	■	■	■	■
Partition LED for each port	■	■	□	■	□	■	■	■
Receive LED for each port	□	■	■	■	■	■	■	■
SNMP Upgrade Process								
Standalone management unit	■	□	■	□	■	□	□	■
Number of ports on standalone management unit	None	N/A	12 (SEHI-22) or 24 (SEHI-24)	N/A	None	N/A	N/A	None
Daughterboard added on each hub in stack or on one hub in stack	N/A	Each hub	N/A	Each hub	N/A	One hub	N/A	N/A
Management Software								
Name of package	AccView	AsantéView	Remote LANView/ Windows	UltraView	SNMPc	D-View Network Management Program	HP OpenView Interconnect Manager	QN5000/SNMPc
Manufacturer	Accton	Asanté	Cabletron	Cameo	Castle Rock Computing	D-Link	Hewlett-Packard Co.	Castle Rock Computing
Platform	Proprietary	Proprietary	HP OpenView	Proprietary	Proprietary	Proprietary	HP OpenView	Proprietary
SNMP transport protocol	IP	IP	IP	IP	IP	IP	IP, IPX	IP
Auto-discover/Draw	■■	■■	■■	□□	■■	■■	■■	■■
Configurable traps or events	■	■	■	■	■	■	■	■
Graphing	■	■	■	■	■	■	■	■
Hub front-panel view	■	■	■	■	■	■	■	■
Mapping editor	■	■	■	■	■	■	■	■
MIB browser/compiler	■□	■□	■■	■□	■■	■■	■■	■■
MIBs supported*	4, 7	1, 4, 7	4, 7	1, 4, 7	2, 4, 5, 6, 7, 8	4, 6, 7	4, 7	2, 4, 5, 6, 7, 8
Node/Intrusion	■	■	□	■	□	■	■	□
Password protection	■	■	■	■	□	■	■	□
Port summary	■	■	■	■	■	■	■	■
Utilities								
BOOTP/FTP	■□	■■	■□	□□	□■	■□	□□	□■
Ping/Telnet	■□	■■	■■	■□	■■	■□	■■	■■
TFTP	■	■	■	■	■	□	□	■
Customer Support								
Free technical support	■	■	■	■	■ (hardware only)	■	■	■
Toll-free technical support	■	■	■ (with contract)	■	□	□	■	□
Telephone support hours (eastern time)	10:00–5:00 M–F	9:00–9:00 M–F	8:00–8:00 M–F	24 hours	11:00–8:00 M–F	10:00–8:30 M–F	9:00–8:00 M–F	11:30–7:30 M–F
BBS	■	■	■	□	■	■	■	□
CompuServe	□	□	■	□	■	■	■	□
Internet mail address	■	■	■	□	■	■	□	□
Internet FTP server	□	■	■	□	□	□	■	□
Warranty	3 years	1 year	90 days	3 years	5 years	3 years	Lifetime	3 years
Extended warranty option	□	□	■	□	□	■	□	□

N/A—Not applicable. The product does not use this component for SNMP upgrades.

* Key: 1—IEEE MIB, 2—IEEE Repeater MIB, 3—Novell HMI MIB, 4—proprietary, 5—RMON, 6—SNMP MIB 1, 7—SNMP MIB 2, 8—SNMP MUX

NetWorth Series 3000 TriSegment Stackable Hub	SMC Elite 3812TP	SynOptics LattisHub 2803
1.8 x 17 x 11.5	1.8 x 17 x 8.6	1.6 x 17.3 x 7.2
24	12	16
Front	Back	Front
5	8	5
120	112	80
☐	■	■
■☐	■■	■■
☐	☐	☐
■	■	■
■	■	■
☐	■	☐
☐	☐	■
N/A	N/A	16
One hub	One hub	N/A
HubView Network Management System	EliteView	Optivity for NMS
NetWorth	SMC	SynOptics
Proprietary	Proprietary	Novell NMS
IP	IP, IPX	IP, IPX
■■	■■	■■
■	■	■
■	■	■
■	■	■
■	☐	■
■☐	■☐	■■
4 6 7	2, 4, 7	3 4 5 7
■	☐	☐
■	■	■
■	■	■
☐☐	☐☐	■☐
■☐	☐☐	■☐
☐	☐	■
■	■	■
■	■	■
8:00–9:00 M–F	8:30–6:00 M–F	9:00–8:00 M–F
■	■	☐
☐	■	■
☐	■	■
☐	■	■
3 years	3 years	1 year
☐	☐	■

SUITABILITY TO TASK

AsantéHub 1012

	POOR	FAIR	GOOD	EXCELLENT
Hub design	●	●	●	●
Network management	●	●	●	○
Ease of SNMP upgrade	●	●	●	○
Value for the price	●	●	●	●

sand dollars if you buy the SNMP option up front rather than purchasing it later. If you do add it on later, you'll have to spend $399 for each SNMP Management Module (and each AsantéHub requires one). Having SNMP in each hub, however, means that each is individually managed, a concept that Asanté calls SNMP redundancy.

AsantéView, the management software required for these hubs, supports either out-of-band or in-band management. Each of these offers the same basic features, but out-of-band management is required to configure the hubs before you use in-band for normal operations. In-band uses TCP/IP, and PC/TCP drivers, from FTP Software, are also included.

All of the basic management features are available from AsantéView: port configuration, performance management, network utilization, node summary, basic hub statistics, auto-discovery, and mapping, as is a graphic representation of the data. There's even an option to send a "hub down" alert to a SkyTel pager, but this is the only situation when the alert will be sent.

Overall, AsantéView is a good application for network management, but you can monitor and manage only MIB II compliant devices. AsantéView is not based on any other management application (such as HP OpenView/ Windows or Novell's NetWare Management System), but it includes all the features you'd want in management software for your hubs.

FACT FILE

EDITORS' CHOICE

AsantéHub 1012

Asanté Technologies Inc., 821 Fox Ln., San Jose, CA 95131; 800-662-9686, 408-435-8388; fax, 408-432-7511

List price (tested configuration): Hardware: five AsantéHub 1012 hubs, $1,299 each; five SNMP Management Modules, $399 each. Total hardware price: $8,490. Total number of ports: 60. Price per port: $142. Software: AsantéView, Version 2.2, $1,299.

In short: Asanté Technologies gives you more bang—granted, for more bucks—than most of the hubs in this roundup, with its AsantéHub 1012, SNMP Management Modules, and accompanying AsantéView management software. Requiring SNMP management on every hub may seem expensive, but this arrangement does give you SNMP redundancy across your hub setup. Asanté offers a quality managed hub solution quite obviously scaled down from its higher end solutions.

479 ON READER SERVICE CARD

Cabletron Systems Inc.

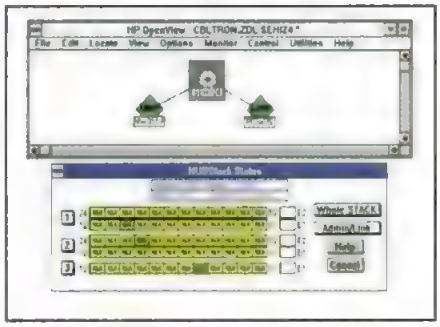
Cabletron SEH-24

BY JEFFREY L. CARRELL

The Cabletron SEH-24 is a low-entry-price, 24-port 10BaseT Ethernet hub, part of the company's SEH line of hubs, which also includes the "intelligent" SEHI-24. Each is part of Cabletron System's HubStack series of networking products.

Cabletron has put some extra thought into the physical design of these two products. Each of the RJ-45 ports has both link- and data-receive LEDs, as well as indicators for collisions and power. The SEHI-24 includes an indicator for the CPU; the SEH-24 has one for management control.

The connections for the nodes and console are on the front of the hub, while the interconnection ports and power connections are on the rear. Cabletron also offers various expansion modules that provide other types of connections, including RJ-45, BNC, AUI, and three types of fiber connections: single mode,



Remote LANView/Windows is based on HP OpenView—but it requires a Cabletron NIC.

JUST WHAT YOU WANT IN WINDOWS-TO-HOST SOLUTIONS: EVERYTHING.

We know very well that you're not about to buy mediocre products just to have the convenience of one-stop shopping. But if you can get superb solutions from a single source, why not?

DCA® pioneered PC-to-host access. IRMA™ WorkStation for Windows™ and Windows NT,™ for IBM® 3270 host access–and new IRMA/400 for Windows, for AS/400 access–spearhead our line of multi-platform IRMA WorkStation software.

They simplify working with host sessions, with features like our QuickBar toolbar and customizable QuickPads™ that let you send host commands or entire scripts with the click of a mouse. They're also robust application development platforms, supporting WINHLLAPI and APPC.

Only QuickApp allows you to create GUI interfaces for host applications without HLLAPI programming expertise.

And when it comes to application development, there's nothing like QuickApp™ for Windows. You can use QuickApp, in combination with Microsoft® Visual Basic,™ Microsoft Visual C++™ or Powersoft® PowerBuilder,™ to create graphical interfaces for your host applications in no time. Because unlike competitive products, QuickApp doesn't require you to write a single line of HLLAPI communications code.

If your remote users need to access your host, our unsurpassed remote node solution, Remote LAN Node,® lets them dial into your LAN and function just as if they were locally connected. For NetWare® LANs, you can now buy NetWare for SAA™ directly from DCA. And our IRMAtrac™ token-ring adapters provide the fastest possible throughput in the 3270 and AS/400 environments.

For a limited time, you can trade up to IWW, IWW/NT or IRMA/400 from any competitive product for just $95 (a savings of up to $400).

You see, there's nothing wrong with wanting everything. You just have to know how to get it.

1-800-348-3221, ext. 60A.*

CIRCLE 901 ON READER SERVICE CARD

DCA WINDOWS SOLUTIONS

HOST ACCESS —*3270:* IRMA WorkStation for Windows and Windows NT. *AS/400:* IRMA/400 for Windows.

GATEWAYS — NetWare for SAA, DCA Select™ Comm Server, IRMALAN/EP.™

MIDDLEWARE DEVELOPMENT TOOLS — QuickApp for Windows.

REMOTE LAN/HOST ACCESS — Remote LAN Node (RLN).

TOKEN-RING ADAPTERS — IRMAtrac.

DCA

The Freedom To Communicate.

COMPAQ Qualified Solution

yes It runs with NetWare

*Or call (404) 475-8380. Offer expires April 30, 1994. ©1993 Digital Communications Associates, Inc. All rights reserved. DCA and Remote LAN Node are registered trademarks and IRMA, QuickApp, QuickPad, IRMAtrac, IRMALAN/EP, Select and RLN are trademarks of Digital Communications Associates, Inc. The Compaq Qualified Solution Logo is a trademark of the Compaq Computer Corporation. Windows, Windows NT, Visual Basic and Visual C++ are trademarks of Microsoft Corporation. All other trademarks are the property of their owners.

ST (straight tip—a bayonet-style connector), and SMA (subminiature type A—a screw-on connector).

Upgrading the Cabletron SEH series hubs to SNMP-based management is easy: you simply purchase one of the SEHI models and connect it to the others. The SEH hubs, which are management-ready, plug into the SEHI unit, and then the entire stack is managed. If you want to connect a PC to the console port, Cabletron sells a $65 accessory kit to do so.

SUITABILITY TO TASK

Cabletron SEH-24

	POOR	FAIR	GOOD	EXCELLENT
Hub design	●	●	●	○
Network management	●	●	●	○
Ease of SNMP upgrade	●	●	●	●
Value for the price	●	●	●	○

The management software, Remote LANView/Windows, is based on the HP OpenView platform. It does, however, require you to have a Cabletron Ethernet network interface card on the network management console even to install the software. And after installation, you'll notice that Cabletron has not provided an icon for the SEHI hubs; you must designate one yourself. Unfortunately, this information is omitted from the documentation.

Even though the management software offers many features and capabilities, including statistics on ports, individual hubs, and stacks of hubs, as well as graphing options, a few features are missing. For example, the auto-discovery will find most of your devices, but will only map the ones from Cabletron. You must add the others manually. And when showing a front panel view, the software will always display information for the SEHI hubs above information for the SEHs. If you want your physical setup to match the display—which is a good idea—you have to be sure to stack the hubs the same way.

Cabletron's documentation leaves something to be desired. The text doesn't always match the accompanying screen shots, and the organization seems poor, especially during installation. You might actually need to call for technical support in order to complete the installation.

The SEH and SEHI hubs offer enterprise hub features in a stackable hub package. The management software operates more as if it were designed for an enterprise system as well, despite the occasional proprietary feel. These hub components from Cabletron are powerful, well-designed products. They have a few quirks, none of which stand in the way of this being a reasonable choice.

FACT FILE

Cabletron SEH-24

Cabletron Systems Inc., 35 Industrial Way, P.O. Box 5005, Rochester, NH 03867-0505; 800-332-9401, 603-332-9400; fax, 603-332-7386

List price (tested configuration): Hardware: Two Cabletron SEH-24 hubs, $1,995 each; one Cabletron SEHI-24 hub, $2,995; two expansion cables, $49 each. Total hardware price: $7,083. Total number of ports: 72. Price per port: $98. Software: Remote LANView/Windows, Version 2.06, $4,995.

In short: This hub solution from Cabletron Systems is made up of powerful, well-designed products with a few quirks. The SEH-24 and SEHI-24 hubs offer enterprise hub features in a stackable hub package. And similarly, the management software, Remote LANView/Windows, functions as if it were designed for an enterprise system.

480 ON READER SERVICE CARD

Cameo Communications Inc.

UltraHub 1000

BY GERARD A. PALMERI

Cameo Communication's UltraHub 1000 series hubs have some first-rate features, including real-time monitoring and security, but they suffer from an awkward cabling design, and they lack the versatility we observed in some of the other products we tested for this roundup. The UltraHub was actually designed by LANCast, but it doesn't manufacture the hub; Cameo does, selling the finished product back to LANCast, which markets it—with some slight cabling modifications—as the LANCast 4392.

The UltraHub 1000 provides 12 RJ-45 or Telco ports (depending on the version purchased), one AUI port, and one switched BNC/AUI port that is used as network backbone connection, all in a compact, utilitarian design. It can easily be stationed in cramped quarters or rack-mounted in a wiring closet, but the unit doesn't have a fan, so it could be situated out in an office area without creating a noise problem or collecting dust.

All of the ports, connectors, and LEDs are located on the front of the hub, which is an advantage if you are mounting it on a rack. The design becomes a disadvantage for the units as stackables, however: With a densely filled panel, there is no room to connect anything. And although the hub makes efficient use of space, Cameo's use of different cables for interhub management and interhub communication, which allows you to break the workgroup into

FACT FILE

UltraHub 1000

Cameo Communications Inc., 71 Spitbrook Rd., Nashua, NH 03060; 800-438-4827, 603-888-8869; fax, 603-888-8906

List price (tested configuration): Hardware: four UltraHub 1000 hubs, $695 each; one UltraHub 1020 hub; $1,395; four AK610-02 Basic Hub to SNMP controllable hub kits, $459 each. Total hardware price: $6,011. Total number of ports: 60. Price per port: $100. Software: UltraView Network Management Software, $495.

In short: Although Cameo Communications's UltraHub series lacks some of the clean hub design we observed in other products, the UltraView management software offers real-time monitoring and security. The UltraHub 1000 is a fair choice for customers who need basic segmenting for their networks. The close design/manufacture relationship between Cameo and LANcast may signal a new trend.

481 ON READER SERVICE CARD

Cameo's UltraView software covers basic network management, but it has no auto-discovery.

SUITABILITY TO TASK

UltraHub 1000

	POOR	FAIR	GOOD	EXCELLENT
Hub design	●	○	○	○
Network management	●	●	○	○
Ease of SNMP upgrade	●	○	○	○
Value for the price	●	●	○	○

segments that can still be managed, leaves the front panel rather cramped. For example, in a stacked configuration it doesn't make sense to use the BNC port because the minimum BNC cable length is two feet. That means you end up with half a meter of cable hanging in the way. (This situation is improved on the LANCast version of the hub, which has the two cables integrated.)

Cameo has three hubs in its 1000 series: the UltraHub 1000 (standard unmanaged), the UltraHub 1010 (controllable), and the UltraHub 1020 (master). The SNMP upgrade process gets a little complicated if you start with several standard unmanaged hubs and then move to create a managed stack.

You must upgrade each of the 1000s to 1010 status, but you also must upgrade one to 1020 status, as that is the master hub in Cameo's master-slave management configuration. (LANCast instead uses the BNC port to cascade the hubs and requires an SNMP daughterboard in each for management.) There are two add-in boards you can use to perform the upgrade: the AK610-02, which converts an UltraHub 1000 to a 1010 ($459), and the AK620-02, which converts a basic 1000 to a 1020 master ($795). But be warned that converting from a basic 1000 to a controllable 1010 is a pricey solution, costing almost $200 more than buying the 1010 outright.

Once the right equipment is in place, the SNMP upgrade process is otherwise relatively simple and straightforward, with two notable exceptions. First, the changes you need to make to both the system and configuration files are not all documented. Second, you are required to use an ODI protocol converter as well as a batch file to load a specific environment for Cameo's UltraView network management software. Once configured, however, UltraView provides a solution for most needs, although it lacks an autodiscovery function.

Cameo's hubs and its UltraView software offer a solution for basic needs only.

Cameo's UltraHub 1000 series, combined with its UltraView software, is at least a reasonable hub and software combination for customers who have only basic needs. Although they lack some of the conveniences or elegance of other products we reviewed here, with some design and software improvements these hubs could break through to become true competitors in the crowded field of entry-level hub solutions.

More Power, More Complex

by Gerard A. Palmeri

Our focus in this review was on stackable hub solutions with Microsoft Windows-based network management software. But network managers have choices among products in which the software is based on other operating systems—OS/2 and Unix, for example. Industry leaders 3Com Corp., which pairs its OS/2-based IsoView, Version 4.0, with its LinkBuilder FMS hub, and Chipcom Corp., which pairs its hubs with the Unix-based ONdemand Network Control System, are just a few of the companies that provide these powerful alternatives.

What do OS/2 and Unix buy you? Multitasking, multithreading operating systems deliver greater power and more functions to monitor larger networks. In addition, integrating a large-scale approach onto one powerful desktop machine reduces costs by minimizing redundant tasks. And you can implement more advanced features that require the strength and flexibility of OS/2 or Unix—such as greater statistics capture to databases and the creation of associations of connections to manage your network more efficiently.

For the power they deliver, however, OS/2 and Unix introduce a level of complexity that network managers shopping in this product area may not want, need, or be interested in supporting. Moreover, the hardware platforms required for either environment demand more commitment in expense, time, and expertise. So, unless you have an OS/2 or Unix machine on your network right now—particularly one that can be dedicated as a network management station most of the time—this type of hub solution may not be worth the expense or time. Moreover, as the PC gets more powerful and cheaper, the performance differences between Windows-based and OS/2- or Unix-based applications will continue to diminish.

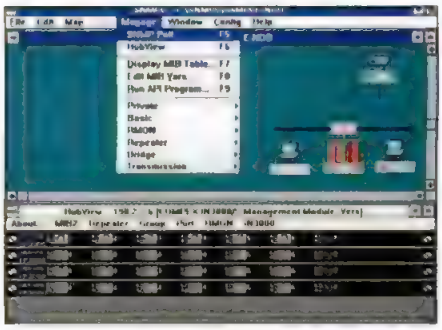
Finally, both 3Com and Chipcom recognize the importance of offering a Windows-based solution: 3Com has introduced Transcend LinkBuilder FMS for Windows, and Chipcom has introduced ONdemand Network Control System for Windows.□

Compex Inc.

Compex TP3000

BY JEFFREY L. CARRELL

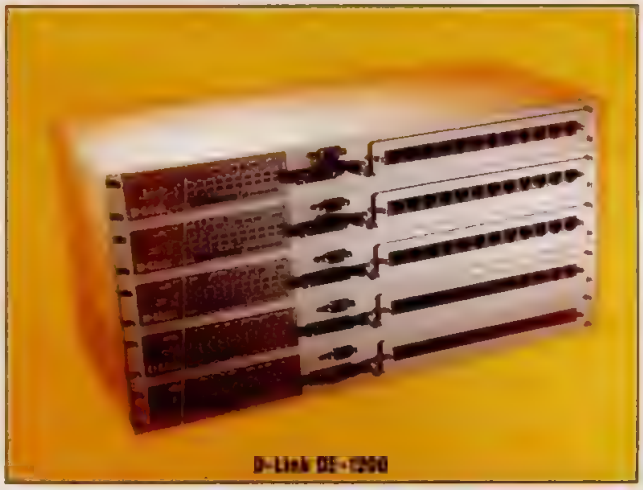
The Compex TP3000 is small in comparison to most other hubs in this story, offering only six ports plus a BNC for intercon-



Compex resells Castle Rock Computing's SNMPc network management software.

Variations on a Hub

A hub is a hub is a hub? Not necessarily. Beyond the basic requirements for signal repeating and processing in these 10BaseT stackable hubs, the vendors in this roundup offered up some variations on the basic hub hardware theme, as exhibited here. Variations in the numbers of ports on the hub (called port density) and how those ports are situated, the presence of additional port types (such as a BNC for coaxial cable or an AUI for fiber-optic cable) for interconnecting the hubs or connecting to network backbone cabling, and the location and number of LEDs all contribute to different choices in connectivity options and flexibility. Cabletron and NetWorth, among other vendors, offer 24 ports on each hub, and each has a clean, manageable design. The Asanté 12-port hubs sport lots of helpful diagnostic LEDs with their well-spaced ports, and D-Link delivers a very straightforward design as well—welcome to the busy network administrator. SynOptics also offers a good mix—with 16 ports and several LEDs, so critical to troubleshooting.


D-Link DE-1200

AsantéHub 1012

NetWorth Series 7000 TelSegment Stackable Hub

Cabletron SEH-24

SynOptics LattisHub 2003

necting. You can daisy-chain up to four TP3000 units together to form a network with (still only) 24 ports, then connect up to four of this type of configuration together via the BNC connectors, for a grand total of 96 ports. (Compex says that there is no actual limit to the number of units you can connect.) Each port has an LED indicator for collision, data, link, and power.

To add network management, you connect an IN3000 Management Module to each group of four TP3000s. The IN3000 attaches to the daisy chain, and has an RS-232 port for out-of-band management, but, like the methods used by Accton and Intellicom to add management, this upgrade does not add ports to the stack. You must also purchase a network management application separately, as Compex does not manufacture one.

Compex does provide its own MIBs that can be compiled into any network management application that allows it. Currently, Compex will sell you Castle Rock Computing's SNMPc, Version 3.1, for $495 if you don't already have your own network management platform running (for a review of integrated network management software see "Behind the Scenes," in *PC Magazine,* December 7, 1993). But if you purchase SNMPc, you also need a separate TCP/IP protocol driver on your management PC. (To this end, Compex will sell you NetManage's Newt for $198.)

In this scenario, the first problem you'll encounter is with SNMPc's autodiscover: It can find some devices on the network, but not the Compex hubs. You have to add these devices manually to the management map. SNMPc also requires a hardware key to be plugged into the parallel port of the management PC in order to operate.

Compex's documentation can be confusing at times. For example, the TP3000 hubs ship with built-in termination, but the documentation we reviewed has not been updated to reflect this; thus, once the devices are connected, they cannot communicate with each other until the administrator figures out exactly how to remove the terminators.

Overall, the Compex stackable hub solution is neither elegant nor easy to work with. You get the hardware from Compex, network management from another vendor (or purchase SNMPc through Compex), and, possibly, TCP/IP drivers from yet another vendor. And you have to compile the Compex MIBs into your network management application—and hope it all works together. This solution gets complicated compared with some of the others presented here.

In the long run, with Compex you'll be spending more money whether you start with management or not. And if you decide to add management later, you'll spend more time and money trying to get everything to work together.

SUITABILITY TO TASK

Compex TP3000

	POOR	FAIR	GOOD	EXCELLENT
Hub design	●	○	○	○
Network management	●	●	○	○
Ease of SNMP upgrade	●	○	○	○
Value for the price	●	●	○	○

FACT FILE

Compex TP3000

Compex Inc., 4055 E. LaPalma Ave., Unit C, Anaheim, CA 92807; 800-279-8891, ext. 1071, 714-630-7302; fax, 714-630-6521

List price (tested configuration): Hardware: 12 Compex TP3000 hubs, $345 each; 3 IN3000 Management Modules, $745 each. Total hardware price. $6,375. Total number of ports: 72. Price per port: $89. Software. Castle Rock SNMPc, Version 3.1, $495

In short: It takes more of these smaller (six-port) units to accomplish the task of segmenting your network. With more units to manage, you might hope for a good software solution from the same vendor. Instead, Compex has MIBs built in for other management platforms to read, or it will sell you Castle Rock Computing's software, but none of these automatically recognize the Compex hardware. In addition, you'll need a separate TCP/IP driver on your management PC

482 ON READER SERVICE CARD

Fine Distinctions

Although they don't have the intelligence of their bridge and router cousins, hubs play a crucial role in your network. Hubs combine port density and relatively low cost to provide the foundation for a 10BaseT Ethernet network. Bridges serve more to segment a network, and routers are needed to connect different networks together. Don't let the terminology bog you down—it is the functionality and relative cost you want to concentrate on.

	OSI (Open Systems Interconnection) layer	Addressing used	Description	Hardware- or software-based	Relative cost	Representative vendors	Intelligence
Routers	Network	Network address	Routers read the network address of a packet and make an intelligent decision about where to route the packet.	Software	Expensive	Cisco Systems, 3Com Corp., Wellfleet Communications	Complex
Bridges (switches)	Data link	Physical (Media Access Control) address	Bridges look at the MAC address of a packet and make a simple decision (forward or do not forward)	Hardware and software	Moderate	Cabletron Systems, Hewlett Packard, Synernetics	Simple
Hubs (multiport repeaters or concentrators)	Physical	None	Hubs do not look at network addresses; they simply repeat the signal to all ports.	Mostly hardware	Inexpensive	Asanté Technologies, NetWorth, SynOptics Communications	None

D-Link Systems Inc.

D-Link DE-1200

BY JEFFREY L. CARRELL

The D-Link DE-1200 and DE-1600 are 12-port hubs that share a versatile design, including the choice of different connector types as well as built-in utilization meters. The 1200 is the upgradable, unmanaged version; the 1600 is a managed hub that can also manage DE-1200s. Their ports are available either as RJ-45 or single 50-pin Telco connectors, depending on your cabling needs. You buy the unit with one type of connector, but you can order a kit to convert to the other type at a later date.

D-Link offers flexibility in its hub design, but D-View, its proprietary management software, is a bit limited and has a few flaws.

For SNMP management, you have a couple of options. The DE-1200 can be upgraded simply by installing an additional module—the D-Link DE-1205 at $895—or you can purchase the DE-1600 management-capable hub for $1,495. (The DE-1600 is identical to a DE-1200 with the DE-1205 module.) Afterwards, the hubs use the same RJ-45 cables for both data and management. You can form stacks providing up to 60 total ports. As with most of the products in this roundup, it is less expensive to go fully managed from the start, using four DE-1200s and one DE-1600. And if you include an additional DE-1600 in your configuration, one hub can act as the primary management hub while the other provides backup in case the primary hub fails.

D-View, D-Link's network management software, requires a 386-based PC or better, 4MB of RAM, 10MB of hard disk space, DOS 4.0 or later, and Microsoft Windows 3.0 or later. The network interface card (NIC) required can be either a D-Link or an Eagle NE1000 or NE2000, or compatible. D-Link also supplies its own TCP/IP driver for the card.

D-View options, each at $1,295, include D-View for NMS, D-View for HP OpenView, and D-View for Cabletron Spectrum. Each provides port and hub performance monitoring, fault management, queries to other SNMP devices, alarm and trap setting, access to the network on a port, and event logging. Graphs are available in bar, line, and table format.

There are two drawbacks to D-View. First, because it is designed to monitor the network from the hub, it cannot recognize the workstation that it is running on. (For that, D-Link sells D-Manager, a DMTF network management package, for $395.) And second, D-View's map editor isn't very versatile, so setting the exact view of your network is sometimes tricky. On a positive note, handy applications such as a BOOTP serve and Ping are included.

D-Link's documentation is adequate but could use some work. For example, you need to add a line to your AUTOEXEC.BAT file to load D-Link's proprietary TCP/IP drivers; this is something the manual fails to mention. D-Link's DE-1200 and DE-1600 have a few unique features, but the proprietary management application is somewhat more limited than the management packages used by the rest of the pack.

FACT FILE

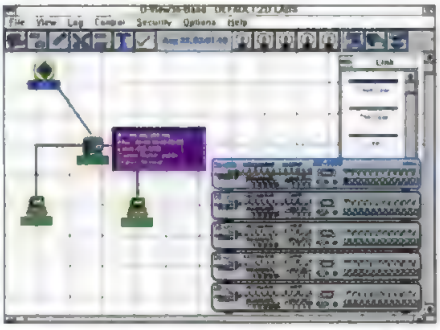
D-Link DE-1200

D-Link Systems Inc., 5 Musick, Irvine, CA 92718; 800-326-1688, 714-455-1688; fax, 714-455-2521

List price (tested configuration): Hardware: five DE-1200 hubs, $945 each, one DE-1205 module, $895 Total price: $5,620 Total number of ports 60. Price per port: $94 Software: D-View Network Management Program, Version 3.0, $395

In short: A versatile hardware design and solid, though proprietary, management software make this package worth consideration Like many of the products here, this one costs less if you buy the management up front, and, like several products, it has documentation and network management software that could use some polishing (important to users of this product set). You can include two DE-1600 managed hubs in your configuration for backup coverage

483 ON READER SERVICE CARD



You can buy D-Link's D-View for NMS, for HP OpenView, or for Cabletron Spectrum.

SUITABILITY TO TASK

D-Link DE-1200

	POOR	FAIR	GOOD	EXCELLENT
Hub design	●	●	●	○
Network management	●	●	○	○
Ease of SNMP upgrade	●	○	○	○
Value for the price	●	●	○	○

Hewlett-Packard Co.

HP EtherTwist Hub/12

BY JEFFREY L. CARRELL

The HP EtherTwist Hub/12 is a 12-port stackable hub offering the easiest management upgrade in this field, although the hub itself is a bit more difficult to use than some. The EtherTwist's connections for power, other devices, and the console are on the rear, along with LED indicators for each port's link connection, activity, collisions, hub fault, and power. There are three LEDs on the front panel that indicate fault, activity, and line on. Unfortunately, because all of the connectors and most of the LEDs are located on the back of the unit, the cabling tends to get in the way. And viewing the LEDs may not be practical if the hub is installed in a rack system.

SUITABILITY TO TASK

HP EtherTwist Hub/12

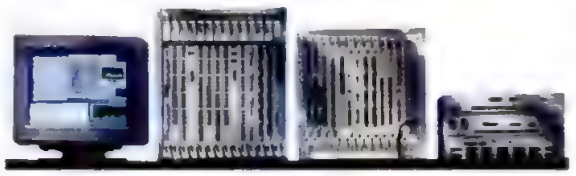
	POOR	FAIR	GOOD	EXCELLENT
Hub design	●	●	○	○
Network management	●	●	●	○
Ease of SNMP upgrade	●	●	●	○
Value for the price	●	●	●	○

Introducing the Lat
A whole new way to

tisSphere™ System. rule your network.

Never again will your network rule you. Now, with the introduction of SynOptics' new LattisSphere System, control returns to your domain.

The LattisSphere System is our complete family of intelligent hubs and management products, delivering an entirely new level of network control. With the addition of the new Lattis System 5000™ intelligent hub and the latest release of Optivity™ management software, the LattisSphere System gives you a complete top-to-bottom solution for managing your network.



The LattisSphere System brings hardware and software together for a whole new level of network control.

At the core of the LattisSphere family is the Lattis System 5000, the first network center hub. Combined with Optivity software, the System 5000 provides a central connection and control point from which to manage your entire enterprise. Connect Lattis System 3000™ wiring closet hubs and Lattis System 2000™ workgroup hubs to your network center, and you have the power to build and manage a brand new type of network—the structured network.

A structured network lets you support the way your organization works—no matter how your buildings are wired. Take Optivity software, for example. Its intuitive user interface and simple drag-and-drop operation allow you to assign network devices to logical workgroups—regardless of their physical location. So you get the security of a central location to consolidate and manage key resources, with the flexibility of distributed LAN segments.

The LattisSphere System is modular, too—buy just what you need now, then integrate new products later. That includes future technologies like ATM and high-speed LAN switching. So as your business grows, you can be assured the LattisSphere System will grow with it. And always be backed by the worldwide leader in intelligent hubs.

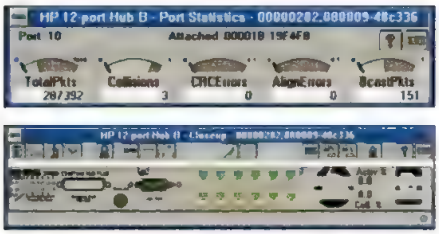
To learn more about the LattisSphere System, call 1-800-PRO-NTWK, ext. 47 or return the attached card. And see how total control can finally reign.

SynOptics

The Network Fabric of Computing

© 1993 SynOptics Communications, Inc. LattisSphere, Lattis System 5000, Lattis System 3000, Lattis System 2000 and Optivity are trademarks of SynOptics Communications, Inc.

CIRCLE 880 ON READER SERVICE CARD



Choose to manage your HP hubs from the venerable OpenView or from another platform.

On the other hand, upgrading to SNMP management capability with the Hewlett-Packard Co. hub was simple: Buy the software-only upgrade kit, fax your registration to HP's 800 number, and you receive an activation password. Then all you have to do is load the software into the hub via the console connector. You don't even need to power-down the hub, nor do you have to concern yourself with one hub in the stack being the master and the rest relying on it for management functions. All the hubs have the same configuration and function, making it easier for support and, if necessary, replacement.

Note, however, that as with other products in this roundup, you'll spend less money by buying a managed stackable hub solution from the start, either by purchasing five fully managed units at a cost of $158 per port, or by buying a 48- and a 12-port unit—both managed—for only $93 per port (based on our 60-port test configuration).

HP OpenView is an elegant, mature network management platform: It carries all the features and functions you need. But all of this comes at a price.

The software for the network management console, HP OpenView Interconnect Manager/Windows, is a long-standing, stable product. (Even so, you could manage the EtherTwist from a variety of platforms and products.) The general look and navigation of OpenView is consistent and easy to use. The context-sensitive help is very good, almost making the manuals unnecessary for most day-to-day operations.

Because OpenView has been around for a long time, it has all the features and functions you need in a management platform, including auto-discovery, auto-drawing of the network, logging, graphing of information, icon representation of devices, view navigation, and real-time traffic analysis. Threshold and alarming setting are also available. If your other network devices are SNMP-compliant and support either MIB II or I, you can manage them from the same console.

Besides having good network management capabilities, OpenView can support either TCP/IP or IPX on the management console. This allows you to avoid having dual protocol stacks on the console.

The documentation includes no technical support phone number, because, according to the manufacturer, technical support is provided by the dealer. With the HP EtherTwist Hub/12, Hewlett-Packard delivers a product that is easy to use and upgrade. Despite some drawbacks in the cabling setup, you won't go wrong by sticking with the Hewlett-Packard name.

FACT FILE

HP EtherTwist Hub/12

Hewlett-Packard Co., 3000 Hanover St., Palo Alto, CA 94304; 800-533-1333; fax, 800-333-1917

List price (tested configuration): Hardware: five HP EtherTwist Hub/12 hubs, $1,195 each; five EtherTwist Hub/12 Upgrade kits, $699 each. Total price. $9,470 Total number of ports: 60. Price per port: $158 Software: HP OpenView Interconnect Manager/Windows $4,000

In short: Among the priciest solutions in this field, the HP EtherTwist Hub/12 arrangement also delivers the easiest management software upgrade. Surprisingly, it does have a somewhat clumsy cabling configuration. HP OpenView is a well-respected—albeit expensive—network management platform, but you could manage the EtherTwist hubs from many other platforms if you choose to.

484 ON READER SERVICE CARD

Intellicom Inc.

Intellicom SP-HUB/B

BY GERARD A. PALMERI

The Intellicom SP-HUB/B hubs feature a unique, easily connected design for the customer in the market for a low-end product, but the company's lack of a well-integrated solution could raise some second thoughts for sites that have more expansive requirements.

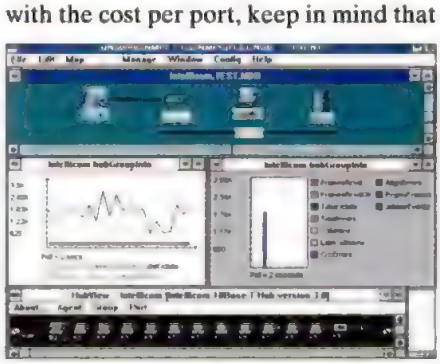
Intellicom's Stack and Play (SP) series hubs are unique among those we tested in their use of a flexible "quick connect" 60-pin cable to daisy-chain as many as five hubs, terminating in a full-chassis management module. This flexible cable winds its way tightly throughout the stack, creating a truly integrated stacked unit. The hub has 12 RJ-45 ports on the back, and each port has LEDs on the front for link, data, and partition. Connection to a backbone network can be done via the BNC port. Intellicom also sells the SP-HUB/C ($999), which includes a switchable BNC/AUI port (we did not, however, test this unit).

SUITABILITY TO TASK

Intellicom SP-HUB/B

	POOR	FAIR	GOOD	EXCELLENT
Hub design	●	●	○	○
Network management	●	●	○	○
Ease of SNMP upgrade	●	●	○	○
Value for the price	●	●	○	○

The SNMP upgrade process involves merely purchasing the SP-SNMP Management Module and appropriate management software. If you are concerned with the cost per port, keep in mind that



Intellicom repackages Castle Rock Computing's SNMPc and calls it QN5000/SNMPc.

You've checked Synoptics, Cabletron, and David Systems. Even a quick glance at our UltraHub family will show you that we offer the excellence found only in their most expensive hubs at an unequaled value.

UltraHub 5000 Intelligent Concentrator
The 12 slot card cage can be expanded from 8 to 264 10BASE-T ports. You get the capability of interfacing to all of the popular connectors. Our QuadChannel architecture gives you four distinct Ethernet channels with optional bridges to connect them internally or to the outside world. The result, a more flexible system, higher network security, greater bandwidth, and an easy way to balance network traffic. Plus, everything plugs in the front for ease of use and maintenance. Add features such as the ability to hot swap all modules, a unique redundant clocking system, redundant power supplies; and you've got the most solid hub of its kind in the market.

Field Upgradable Workgroup Hub System
With the UltraHub 1000 you can grow in the field by cascading units and by adding our SNMP management module. Build from a 12 port unmanaged system to a 60 port fully managed system with a single hub master and hub slaves. And, you inherit all of the UltraHub 5000's technology in a workgroup hub.

Integrated Network Management
All of our products work with UltraView, our Windows based network management software. CAMEO's custom ASICs provide real-time monitoring of each port. From an in-band or out-of-band port you can diagnose and manage ports on an individual basis.

Now lets face it Ethernet, is Ethernet
So, compare us on a price and feature basis with Synoptics, Cabletron, and David Systems. You'll find that CAMEO's value is undeniable. If you would like free literature and the name of a reseller nearest you, please circle reply card or call us at
1-800-GET-HUBS.

CAMEO COMMUNICATIONS, INC.

CIRCLE 934 ON READER SERVICE CARD
USA: 71 Spitbrook Rd., Nashua, NH 03060
Tel: 603-888-8869, Fax: 603-888-8906
Asia: 2F, No. 44 Park Ave. 2, Science Park, Hsinchu, Taiwan, R.O.C. Tel: 886-35-779288; Fax: 886-35-777461

If you haven't looked at CAMEO you haven't looked.

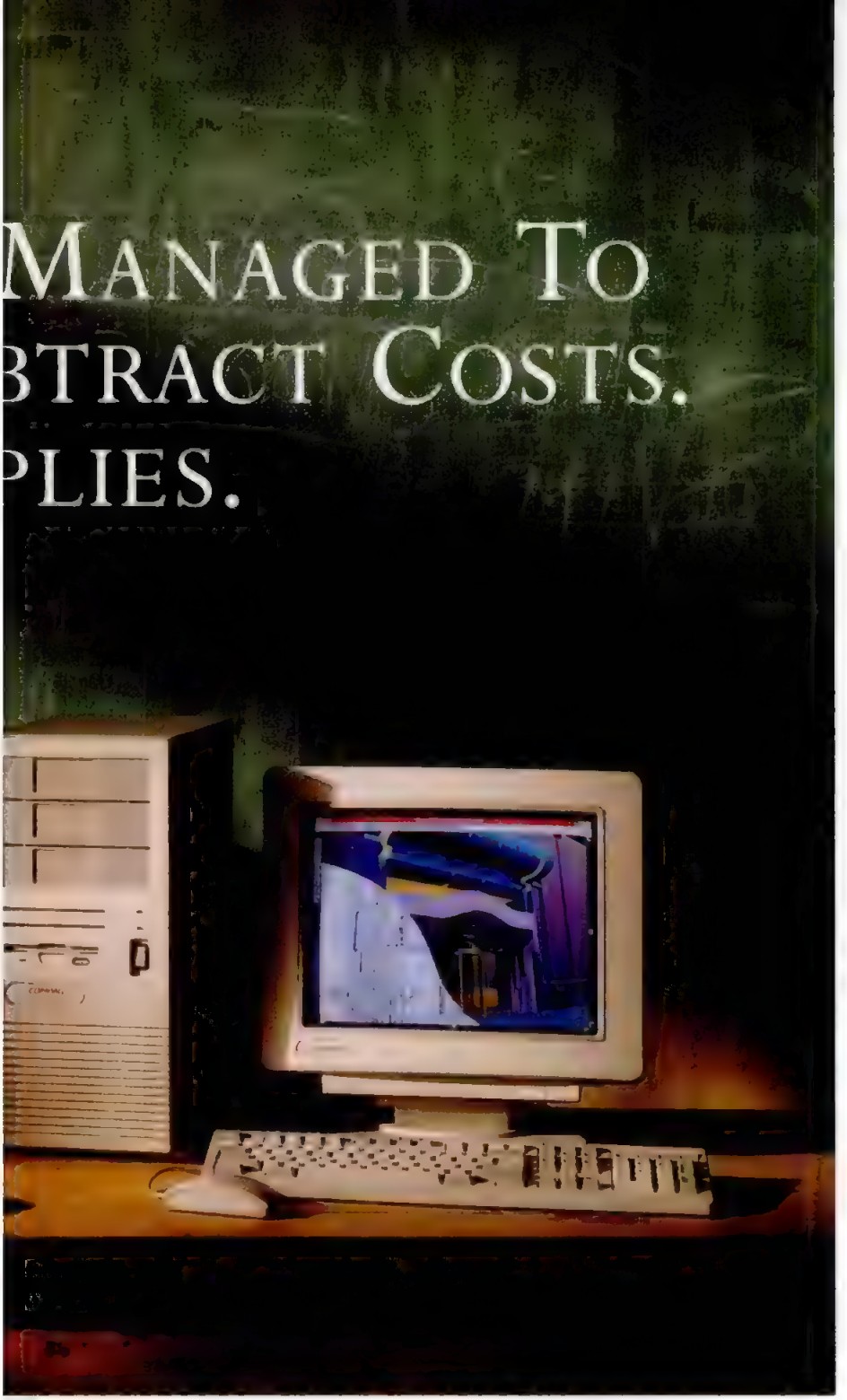
THE FIRST PROLINEA
ADD FEATURES AND SU
NOW IT MULT

When first introduced, the Compaq ProLinea turned the industry upside down by setting a new standard for affordable computers. So naturally, after having sold hundreds of thousands of ProLineas, we decided to build two more.

Introducing the complete ProLinea family, with a model for everyone in your business, from a traditional desktop to a new all-in-one unit, mini-tower and a complete range of multimedia PCs.

The new ProLinea Net1 features a sleek design

©1994 Compaq Computer Corporation. All Rights Reserved. Compaq Registered U.S. Patent and Trademark Office. ProLinea is a registered trademark of Compaq Computer Corporation. Product names mentioned herein may be trademarks and/or registered trademarks of their respective companies. Pentium and the Intel inside logo are registered trademarks of the Intel Corporation. *Estimated selling price; actual pricing may vary.



And it comes with a 486SX/25 processor and includes an extra-sharp 14" SVGA display.

The new ProLinea MT, on the other hand, features a mini-tower design with five slots and five bays. It includes Local Bus Graphics and is available in three processors, from 486SX/33 to 486DX2/66, and all are upgradeable to Pentium technology.

While each ProLinea is unique, they all share features in common. Every ProLinea is already loaded with MS-DOS 6 and MS Windows. And each also includes TabWorks, a new software interface available only from Compaq that makes using Windows even easier. (And you more productive.)

Of course, no matter how many different models we make, each one has to be aggressively priced to continue the ProLinea tradition. That's why the ProLinea Net1 starts at just $1,099, the mini-tower at $1,449, and multimedia models at just $1,549.* All of which is good math no matter how you calculate it. For complete details, just call 1-800-345-1518. COMPAQ

intel inside

with an integrated monitor. But despite the extremely small footprint, it's anything but meek.

For starters, there's an integrated network interface for either Ethernet or Token Ring environments.

CIRCLE 137 ON READER SERVICE CARD

FACT FILE

Intellicom SP-HUB/B
Intellicom Inc., 20415 Nordhoff St., Chatsworth, CA 91311; 800-992-2882, 818-407-3900; fax, 818-882-2404

List price (tested configuration): Hardware: five SP-HUB/B hubs, $899 each; one SP-SNMP Management Module, $795. Total price: $5,290. Total number of ports: 60. Price per port: $88. Software: QN5000/SNMPc, Version 2.0, $1,185.

In short: The Intellicom SP-HUB/B offers an excellent cabling solution as well as easy management upgrades. Unfortunately, Intellicom's network management solution, a customized version of Castle Rock Computing's SNMPc, is not well-integrated with the product. Managers of such stackable configurations should not be expected to integrate their hubs manually with their management software. In any case the documentation should fully explain the process.

485 ON READER SERVICE CARD

the management module does not add any ports. Not surprisingly, it is less expensive to purchase a fully managed group up front: If you were creating a 60-port stack you'd save $299 by buying management in advance.

For its network management software, Intellicom repackages Castle Rock Computing's SNMPc, calling it QN5000/SNMPc, and includes NetManage's Newt TCP/IP for Windows. QN5000/SNMPc works relatively well, although it has a primitive mapping editor as well as problems with the auto-discovery of network segments and elements. It provides the real-time graphing, MIB compilers, port information, and configurable alarms and notifications most network managers need. We did have some trouble detecting SNMP-enabled elements with QN5000/SNMPc using Newt, and ultimately we used an alternative TCP/IP package, FTP Software's PC/TCP, which seemed to solve the problem.

Intellicom's integrated solution is workable, though deficient in several areas. Entry-level hub customers should not be expected to have to integrate their hubs manually with management software; if they must, the process should be better documented. More software features and conveniences could be added as well. To its credit, the SP-HUB/B has an excellent cabling solution and an easy management upgrade, but these are not enough to earn it more than a lukewarm recommendation.

NetWorth Inc.

Series 3000 TriSegment Stackable Hub

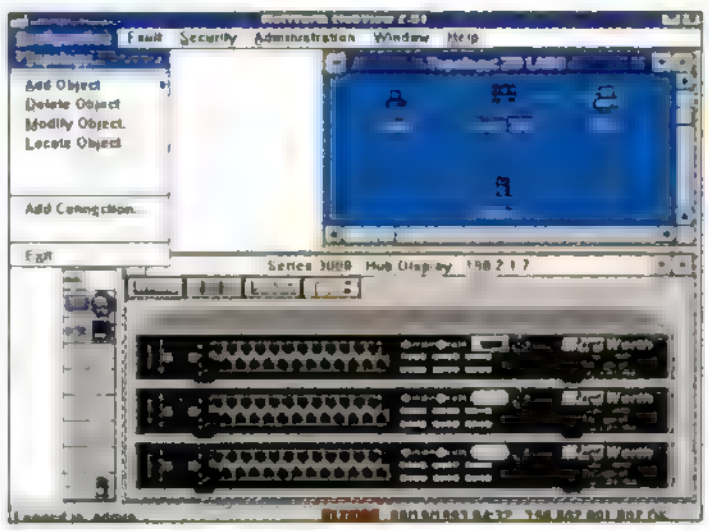
BY JEFFREY L. CARRELL

The Series 3000 TriSegment Stackable Hub, from NetWorth, offers a high port density in a small box and can be upgraded for network management fairly easily. Each TriSegment has a total of 24 ports in a box only 1.8 inches high; each also has an expansion slot available that is configurable as an alternative port 1, supporting BNC, AUI, and ST (straight tip) fiber connections.

In addition to the capacity to stack as many as five hubs to form a single network, each TriSegment hub, as the name implies, can be separated into three segments of eight ports each. By using a unique front-panel push button, the administrator can assign individual clients to one of the three segments and can thus balance the bandwidth load and create a better performing network without going to the management console.

Each port has a multifunction LED that indicates status for activity, backplane assignment, enable or disable, and link. Using a front-panel switch, you select which status the LEDs will display. Hub interconnections and power cabling are located on the rear, allowing the data and console connectors to be on the front of the hub.

To add network management capability to the TriSegment, you just need to purchase an STMDB TriSegment Management Board, which upgrades the STM24 to an STMM24—a TriSegment Management Hub. Only one management hub is required for each stack of five hubs. However, you'll save $295 by buying an STMM24 from the start, rather than upgrading later.



The HubView Network Management System is a proprietary package lacking a few features.

HubView Network Management System, the application used for managing Series 3000 (and Series 4000) hubs, is not based on any standard network management application platform, and some features are missing. For one, because HubView can manage or query only the Series 3000 and 4000 hubs—you cannot use it to graphically manage any other devices on your network. Although the other devices appear on the map, you can get only basic SNMP statistics about them, and you cannot assign a hotkey to the icon. On the plus side, the HubView

SUITABILITY TO TASK

Series 3000 TriSegment Stackable Hub

	POOR	FAIR	GOOD	EXCELLENT
Hub design	●	●	●	●
Network management	●	●	○	○
Ease of SNMP upgrade	●	●	●	●
Value for the price	●	●	●	○

FACT FILE

Series 3000 TriSegment Stackable Hub
NetWorth Inc., 8404 Esters Blvd., Irving, TX 75063; 800-544-5255, 214-929-1700; fax, 214-929-1720

List price (tested configuration): Hardware: three STM24 TriSegment Stackable Hubs $1,995 each; one STMDB TriSegment Management Board $1,295; two Series 3000 connector cables, $99 each. Total hardware price: $7,478. Total number of ports: 72. Price per port: $104. Software: HubView Network Management System, Version 2.01, $1,495.

In short: The parts are better than the whole here. A high port density—24 ports on a standard-size unit—and easy segmenting recommend NetWorth's hubs. But the faulty documentation complicates installation, and the proprietary management software lacks certain desirable graphical features.

486 ON READER SERVICE CARD

software does offer statistics available by port and by hub, configuration control, thresholds for alarms and events, and graphing of the above data for reports.

NetWorth's documentation needs a great deal of work. The manuals for installing HubView have numerous errors, and the release notes, which were needed in order to install the software successfully, were too sketchy to be really useful. Although NetWorth's Series 3000 hubs offer an excellent physical design, the all-important peripheral material—the management software and the documentation—leave a lot to be desired.

Standard Microsystems Corp.

SMC Elite 3812TP

BY GERARD A. PALMERI

Standard Microsystems Corp.'s SMC Elite 3812TP is an extraordinarily well-designed, high-performance hub, supporting as many as eight other hubs, or 112 ports in a single stack. Its segmentation and redundancy features are first-rate and are unexpected from an entry-level hub solution. Unfortunately, its few drawbacks are significant and steal some luster from an otherwise top-notch product.

The Elite provides a clean, compact design for 12 RJ-45 ports, one dedicated AUI port, and an optional BNC/AUI port, all located on the rear. This is one of the few products we tested that makes effective use of ports 13 and 14 other than for a network backbone connection or hub interconnection. Wisely, the LEDs for collision, data, link, management-enabled, partition, power, and segment status are mirrored on both front and back, solving the orientation dilemma. The Elite supports management module redundancy; SNMP can be supported with a single Network Management Module among the stacked hubs or with multiple modules to provide transparent slave redundancy if the master module fails.

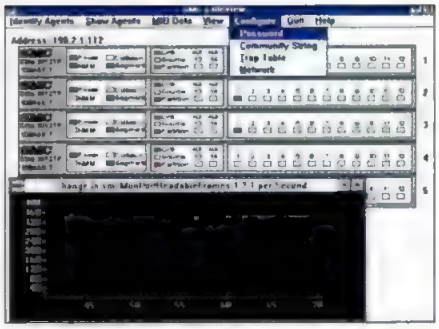
So much of this hub solution is well designed that it is surprising that Standard Microsystems overlooked two significant practical matters. First: The power cord supplied to the hub uses a large bricklike AC adapter, a major hindrance to choosing a location for this equipment. A network manager who has eight hubs stacked together must contend with eight of these AC adapters. Whether the hub stack is rack-mounted or placed on a table top, these adapters will get in the way. Second: Hub interconnection is accomplished by daisy-chaining 50-pin cables with terminators at the top and bottom of the stack. The connectors for the cables are directly on top of each other in the back, which forces the cables to bow out so much that they increase the unit's depth by more than 3 inches.

SUITABILITY TO TASK

SMC Elite 3812TP

	POOR	FAIR	GOOD	EXCELLENT
Hub design	●	●	○	○
Network management	●	●	●	○
Ease of SNMP upgrade	●	●	●	○
Value for the price	●	●	●	○

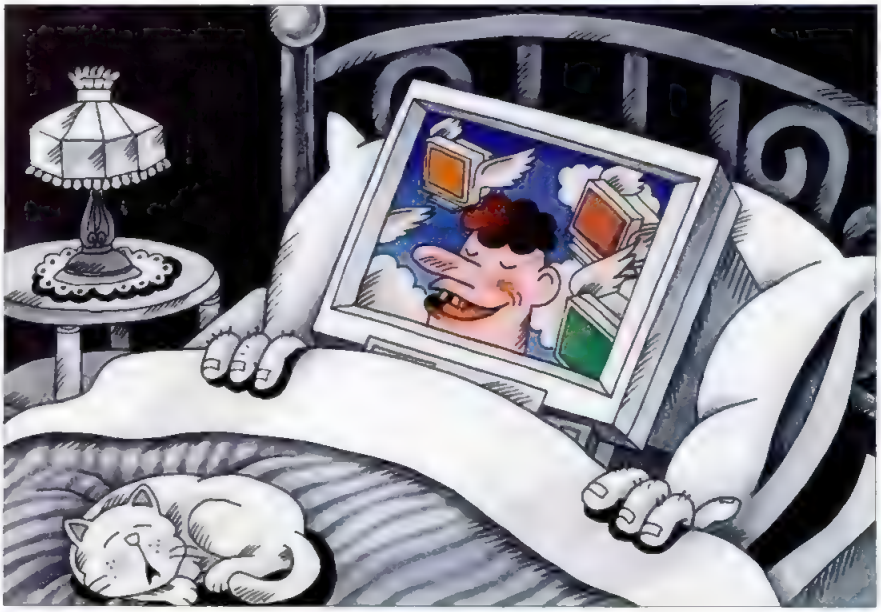
EliteView, SMC's SNMP management software, is Spartan yet functional, complete, and easy to use. The SNMP upgrade process entails installing one daughterboard, then using the supplied DOS-based utility to configure the stack either in-band or out-of-band. The utility can function in either mode. The process is well explained in the concise yet complete documentation. EliteView can use either IP or IPX addressing or both concurrently; it supports auto-discovery of SNMP-enabled devices, is capable of displaying line-graphs of hub



SMC's EliteView may seem Spartan, but it is surprisingly functional, complete, and easy to use.

MONDO MONITOR®

MAG INNOVISION



As Delmer slept, visions of new screen savers danced in his MAG MX17F head.

(Due to images of unparalleled quality, Delmer always remembered his dreams the next morning.)

WIN A MAG MX15F MONITOR. SEND YOUR CARTOON IDEAS WITH RETURN ADDRESS AND TELEPHONE NUMBER TO MAG INNOVISION AT 2801 SOUTH YALE STREET, SANTA ANA, CA 92704, 800-827-3998, 714-751-2008 (IN CA), FAX: 714-751-5522. IF YOUR ENTRY IS SELECTED, YOU WILL RECEIVE A MAG MX15F MONITOR. ALL IDEAS SUBMITTED BECOME THE PROPERTY OF MAG INNOVISION.

CIRCLE 087 ON READER SERVICE CARD

FACT FILE

SMC Elite 3812TP

Standard Microsystems Corp., 80 Arkay Dr., Hauppauge, NY 11788; 800-762-4968, 516-435-6255; fax, 516-273-1803

List price (tested configuration): Hardware: five SMC Elite 3812TP hubs, $995 each; one Network Management Module, $695. Total hardware price: $5,670. Total number of ports: 60. Price per port: $95. Software: EliteView, Version 3.0, $295.

In short: This otherwise well-designed solution has two hub-design flaws—a bricklike AC adapter on each hub and an awkward cabling scheme. A managed stack of Elite hubs accommodates more than 100 ports and boasts concise, complete documentation. SMC also offers better-than-average management software and SNMP upgrade. If you can live with the flaws, this solution will work well in many installations.

487 ON READER SERVICE CARD

and port statistics, contains a MIB browser, and tracks utilization of network resources.

Overall, with the exception of the two unfortunate design points, Standard Microsystems provides a hub and management software solution that will work—and work well—for most network installations.

SynOptics Communications Inc.

LattisHub 2803

BY GERARD A. PALMERI

With its LattisHub 2803 and LattisHub 2813, SynOptics Communications combines rigid, well-defined hardware with flexible software. Together these hubs provide up to 80 ports on a stack—fewer than do some competitors—but Optivity 1.0 for NMS management software is designed to handle growth.

SUITABILITY TO TASK

LattisHub 2803

	POOR	FAIR	GOOD	EXCELLENT
Hub design	●	●	●	●
Network management	●	●	●	○
Ease of SNMP upgrade	●	●	●	○
Value for the price	●	●	●	●

The LattisHub 2813 is a 16-port, SNMP-based managed hub. The unmanaged 2803 hubs are connected to it in a hub-and-spoke (also known as master-slave) geometry. Each 2813 can support up to four 2803s. The 2813 can be configured using a local terminal service port, an out-of-band RS-232 port, or in-band cabling. It also can be configured to support each LattisHub 2803 as an individual segment.

SynOptics has done well in making its products easy to use: Its hardware is among the best designed in this roundup. The LattisHub 2803 supplies 16 RJ-45 ports and one AUI port for network backbone connection per hub, all located in the front. Diagnostic LEDs include link and partition for each port, collisions, data, management-enabled, and power, along with a numerical representation of which expansion slot each 2803 hub occupies in the 2813 master. This allows the administrator to perform diagnosis without having to see both sides of the stack.

SynOptics is unique in its management configuration. SNMP is built-in to the LattisHub 2813, so upgrading simply means buying a management hub.

Optivity 1.0 for NMS is impressive software, though somewhat complicated to install. So be prepared for an advanced package. Unless you are looking for software specifically designed to handle growth, Optivity may be more application than you'll want for basic hub management. It is based on Novell's NMS, which is included with the Optivity package. NMS has a great mapping editor (with some interestingly realistic icons), Novell's TCP/IP software, an auto-discovery network watching tool, and SNMP for your NetWare server. After you have installed and configured NMS, Optivity provides detailed instructions for editing both the management client's and the network's configuration files to optimize memory usage. The process also includes downloading code from the Optivity workstation to your LattisHub 2813 hub to create a BOOTP server. (Optivity and NMS need more than 500K of free space of your 640K of low-memory RAM to operate, which means you must dedicate a workstation as a management software platform.)

EDITORS' CHOICE

FACT FILE

LattisHub 2803

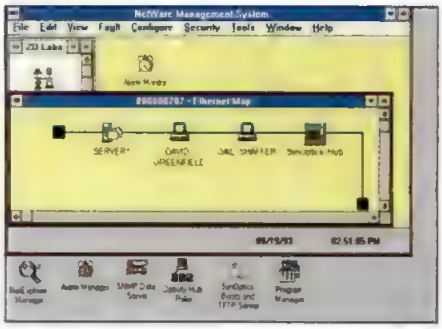
SynOptics Communications Inc., P.O. Box 58185, 4401 Great America Pkwy., Santa Clara, CA 95052-8185; 800-776-6895, 408-988-2400; fax, 408-988-5525

List price (tested configuration): Hardware: four LattisHub 2803 hubs, $1,095 each; one LattisHub 2813 hub, $1,995 Total hardware price: $6,375. Total number of ports. 80. Price per port: $80 Software: Optivity 1.0 for NMS, $3,495

In short: With some of the best designed hardware in this field, the LattisHub series and its impressive feature-rich Optivity for NMS management software set the pace for stackable hub solutions. You might expend a bit more time and resources on these SynOptics products, and the software installation may seem daunting to some But the payoff in features and flexibility is certainly impressive.

488 ON READER SERVICE CARD

Choosing the LattisHub 2803 and 2813 and Optivity requires some commitment, but the choice does carry its rewards. Optivity can support IP, IPX, or both, and includes a well-designed mapping editor, network monitor, and object configuration with a summary log. Optivity also allows scalable views of a network with a hub view, a view by Ethernet segment, by locale, or by wide area. It makes a full set of statistics and high-quality graphs available in combination with NMS.



Optivity for NMS—based on Novell's package—is impressive network management software.

SynOptics' managed hub system is a high-quality solution, requiring a significant commitment of time and resources. The top-notch end result will be worthwhile for all but the smallest shops. □

PC MAGAZINE

Network Edition

THE LATEST NETWORK PRODUCTS AND MANAGEMENT TECHNIQUES

On the Road to ATM

Hub vendors may have announced their ATM strategies, but how will you migrate your existing hub into their ATM world?

by Nick Lippis and John Morency

Munch! Smash! Crunch! Those aren't just the sounds of a multicar pileup in the heat of rush hour. Those are the sounds of data on today's corporate networks. Flooded by increasingly powerful PCs and bandwidth-hungry applications, networks are starting to crumble under the strain of the traffic.

Buyers looking at tomorrow's networks seek a technology that offers higher bandwidth and makes adding users to and removing users from a LAN simpler. For some, faster Ethernet networks will do. Others will be able to survive by reducing the number of users connected to each LAN. But others are desperately looking for dramatically higher bandwidth, and for them the solution most widely touted is asynchronous transfer mode (ATM).

ATM—as if you haven't heard by now—promises seamless interconnection of local area networks and wide area networks. It is a high-speed specification that is built around fixed-size packets—or cells—that are rapidly switched between end stations.

ATM also lets network managers cluster users dynamically into groups. These virtual workgroups (V-Groups) mean that all nodes, no matter where they are located, can be treated as if they exist on the same network segment, making adding, removing, and moving users simpler and more manageable. V-Groups, combined with the high bandwidth, ultimately low cost, and broad industry support of ATM, are jerking the heads of vendors, carriers, and network managers.

Moving to ATM poses significant challenges to today's network buyers. They fear that they will have to replace their entire infrastructure—drop their hubs, rip out their cabling, and throw away their network adapters. Migrating to ATM, then, perhaps more than using ATM, is what network buyers must consider today. And the map of this transition lies in the ability to extend the core of the network—the wiring hub.

Here, then, is a look at just this issue; how three of the leading hub vendors—Cabletron, Chipcom, and SynOptics Communications—currently plan to migrate their product lines to ATM.

For all of these vendors, switching is the key to migrating to ATM. Depending

NETWORK EDITION INDEX

First Looks
HP OpenView for Windows 7.1 ..... NE00
NetWare Connect 1.0 ..... NE00
Lannet LanSwitch 208 Module NE00

New & Improved
NetWare for LAT NE25
Call Connection Manager NE25
Intelligent Messaging interface for Unix NE28
Cabletron ESX-MIM NE28
Trak/Report 2.0 ..... NE28

Lippis on Networking
The Router Meets Jurassic Park NE31

Derfler & Greenfield
Searching for the Right Modem Standard NE33

Other Network Stories In This Issue
A Hub Above 247

imagine a hub uniquely able to adapt to your

When it comes to high-performance hubs, the new DEChub™ 900 MultiSwitch is a whole different animal. For starters, it is the only hub with a technology-independent backplane that supports up to eighteen separate LAN segments, including Ethernet, Token Ring or FDDI in any slot. And it's ATM-ready today. The DEChub 900 MultiSwitch ensures your network can handle future growth and changes. Over 3GB of throughput gives you all the bandwidth you'll ever need to send anything, anytime.

The DEChub 900 MultiSwitch is the most flexible and cost-effective hub around. DEChub 900 modules, as well as the award-winning DEChub 90 modules, all work as single units or snapped into the DEChub 900 MultiSwitch backplane. And all DEChub modules are truly "smart" —just power them up and they know what to do.

Management has never been simpler. You can manage the DEChub 900, DEChub 90 and all DEChub modules from a single PC or workstation. And the graphical user interface of our HUBwatch™ software makes switching and reconfiguring LAN segments as simple as the click of a mouse.

Curious to know more about this interesting creature? Then call your local Authorized Digital Reseller, or 1-800-DIGITAL. Please reference BFA when you call. And get a hub that shows its true colors when it's time for a change.

The new DEChub 900 MultiSwitch makes managing growth and change simple.

PUTTING IMAGINATION TO WORK

changing environment.

digital™

CIRCLE 930 ON READER SERVICE CARD

on the type of switching implemented, network managers can get the increased bandwidth and V-Group functionality of ATM today on a more limited scale.

Currently, there are three types of switches: configuration, frame, and cell.

Configuration switching lets ports be assigned to different networks through software, thus enabling V-Groups. All the vendors reviewed here support configuration switching today. With today's configuration switches, network managers can create V-Groups, using software to add, delete, and move users between networks. But with today's LANs, those users must be connected to the same hub. In contrast, ATM allows network managers to switch users connected to separate hubs, even if they are on separate continents.

Frame switching provides increased throughput by dedicating networks to each segment and reducing the delay a packet experiences as it traverses an internetworking device. This allows for higher performance through microsegmentation—the reduction in the number of users per LAN segment down to less than three. With fewer users sharing a LAN segment, each user has more bandwidth. However, while these switches may provide users with up to 10 Mbps or so of bandwidth, ATM will give users up to 50 Mbps of bandwidth. SynOptics is currently the only vendor to offer frame switching.

Cell switching is ATM switching, which offers the shortest delays, the highest bandwidth possible, and full V-Group functionality. Though ATM switches may be available from hub vendors in the future, SynOptics was the only vendor reviewed to provide an ATM switch.

SOMETHING FOR EVERYONE

For customers, then, looking to migrate to ATM for reasons of configurability, all of these vendors offer a solution. But when performance is the issue, SynOptics offers the best course today by virtue of the fact that it is the only one of these vendors to offer an effective combination of configuration, frame, and ATM switching.

Even with SynOptics, there are several issues that users need to investigate. Conversion of individual data frames to ATM-format cells is probably the biggest one. All of the hubs from these vendors will eventually accept modules with cellification logic, which will convert a LAN frame into a 53-byte ATM cell, but few offer that today.

The routing function here is also very important: It will allow two desktops to communicate through an ATM network via any shared LAN. The router software provides the critical function of translating data between different network types. Without the right routing software, your ATM LANs will be separated from the rest of your network.

Today's switch effectively increases manageability in an office. ATM increases manageability across continents.

CABLETRON SYSTEMS

Cabletron's ATM strategy hinges on a four-phase rollout of ATM products. The first was the Service Point module, which Cabletron provides for its MMAC hub line. It uses Fore Systems' Silicon Graphics ATM interface module to route between ATM and Ethernet, Token-Ring, and FDDI networks.

The second phase was the Bridge-Router Interface Module (BRIM) router, which supports ATM, among other interfaces, via a specialized daughterboard. This product was announced in June 1993 and is currently shipping. Thus far, Cabletron has been right on schedule relative to delivery target dates.

Phase Three, scheduled for implementation in the first quarter of 1994, will result in the delivery of a hub that will provide frame switching, cell switching, and on-board routing much like the SynOptics hubs. These capabilities, combined with current ATM support within the MMAC, will provide the means for Cabletron to be an equally viable vendor in supporting the LAN-to-ATM transition.

ROUTER VERSUS HUB IMPLEMENTATION

The advantage of the BRIM router approach to ATM support is that it can be implemented in both the MMAC and MicroMMAC hub families (unlike the DNSMIM, the ATM module Cabletron codeveloped with Fore Systems).Thus, it increases network managers' choices for interfacing departmental hubs to ATM-based backbones. The disadvantage, however, is that MMACs and MicroMMACs cannot be connected to a central hub, only to a central ATM switch (such as Fore's ASX-100).

Network management services for ATM are also a straightforward extension of current product offerings. The ATM BRIM interface is managed via the EMME6 Device Management Module in Cabletron's Spectrum Network Management System and Spectrum for Open Systems.

Cabletron plans to announce a new hub this quarter. The hub will be based on Cabletron's Secure Fast Packet Switching (SFPS), which will offer advanced support for switched LANs including V-Groups across Ethernet, Token-Ring, FDDI, and ATM technologies. It will also support the integration of routing services to convert frames and cells between legacy LANs and ATM.

The next-generation hub will provide the means for Cabletron to catch up to its competition in the provision of switched LAN services both for mainstream frame technologies such as Ethernet and Token-Ring and for ATM cell switching. In addition, on-board support of bridging and routing via a BRIM card is both unique and internally consistent with the existing scope of ATM support that Cabletron currently provides.

As a result of the Switched Ethernet support that is provided by the ESX-MIM as well as the mixed-media switched LAN support that is provided within the next-generation hub, Cabletron will be able to provide most of the product underpinnings that will be necessary for users to begin incremental transition of their LANs from conventional LAN technology to ATM technology over the course of 1994 and beyond. The net result of all this is that a self-produced ATM switch may well be the prin-

Network needs. User Needs. They demand a perfect balance. And Intel's LANDesk™ Manager software gives you all the management capabilities you need to perform feats of LAN control.

Yes, control. LANDesk Manager software is the first completely integrated suite of solutions that lets you centrally view and manage your PC network. From desktops, to servers, to segments and services. And because you make fewer trips to your users, desktop management gives you more time for other tasks.

So if you're tired of shouldering the burden of LAN control, call 1-800-538-3373 and ask for document #1225. We'll send a free LANDesk Manager software demo disk, and you may even qualify for a free evaluation unit. Then your users can really pile it on.

intel®

©1993 Intel Corporation.

CIRCLE 882 ON READER SERVICE CARD

ATM Migration Plans

■ = YES □ = NO

	Cabletron Systems MMAC Family	Chipcom Corp. ONline System Concentrator	Chipcom Corp. ONcore*	SynOptics Communications LattisNet System 3000	SynOptics Communications LattisNet System 5000	SynOptics Communications LattisCell ATM Switch
Physical Architecture						
Backplane independent of LAN technology	■	■	■	□	□	□
ATM support	New hub	Module	Module	Module	Backplane, module	Backplane, module
Type of switching supported	Configuration, frame, ATM	Configuration	Configuration, ATM	Configuration	Configuration, frame, ATM	ATM
Internetworking services supported	Routing	Routing	Routing	None	Routing	NoneA
Management Architecture						
Management platform	Native Spectrum, NetVIEW/6000, NMS, OpenView, SUNnet Manager via Spectrum for Open Systems	NetVIEW/6000, SUNnet Manager	NetVIEW/6000	NetVIEW/6000 SUNnet Manager	NetVIEW/6000, SUNnet Manager	NetVIEW/6000, SUNnet Manager
ATM management application	Spectrum	ONdemand NCS	ONdemand NCS	Optivity	Optivity	Optivity Integrated LattisCell ATM Management Application
Scope of virtual LANs	Info not available	Within hub	Between hubs	Within hub	Between hubs	Between hubs
Optimized hub placement	Workgroup/backbone	Workgroup	Backbone	Workgroup	Backbone	Backbone
Key partners	None	None	IBM	Kalpana	None	Network Peripherals, Washington University

* The vendor has not finalized the product name.

cipal differentiator between Cabletron and its competition.

CHIPCOM

Chipcom's ATM strategy focuses on the use of switched LANs and virtual workgroups across a common LAN backbone. The result is a gradual and effective migration to ATM. Its recent acquisition of Artel (a manufacturer of high-speed switched LAN hubs), along with its ongoing partnership with IBM and planned use of its ATM technology, indicates that the company is quite serious about being competitive in this market.

Both of Chipcom's ONline concentrators sport a 2-Gbps switching capacity, which is LAN technology–neutral and also allows plug-in modules to be placed inside the hub independently of slot location.

Chipcom, however, does not have any grand plans for the 17- and 6-slot ONline concentrators when it comes to ATM. It is contemplating developing a module for these hubs that will provide cellification logic and connect to a new hub that was demonstrated at Interop Paris. As of this writing, Chipcom's ATM strategy and product directions are a bit hazy. Here is what we know.

Chipcom has been working with IBM on two fundamental dimensions: network management and ATM. By the second half of 1994, Chipcom will ship a new ATM hub based on an IBM ATM chip set. The hub architecture will be another passive backplane, however, operating at 8 Gbps, a fourfold improvement in performance. If the price is held constant, though, Chipcom may have a winner. All cell switching will occur on the modules, not in the backplane. These passive backplanes are high-speed traffic paths. The ATM hub is to be positioned as a backbone hub or hub-of-hubs. This hub will be backward-compatible with the existing ONline module set, therefore, providing some level of investment protection.

There will be an ATM module or modules supported on this hub as well. The modules will be unique in that they will support frame input from the backplane. Frames may enter the module from the hub backplane, where they will be sliced into cells and forwarded. Mixed MAC translation will be accomplished via routing technology located in the hub, perhaps on the module. Since IBM has been promoting LAN emulation in the ATM Forum, we expect that it will be supported within this hub as well.

In terms of network management, Chipcom's ONdemand Network Control System, Version 2.0 is supported on a wide range of platforms, including Digital's Polycenter, HP OpenView, SUNnet Manager, OS/2, and NetVIEW/6000. Chipcom will increasingly de-emphasize maintenance releases for Digital's Polycenter while placing most of its management investments in NetVIEW/6000. In terms of ATM, there will be extensions to ONdemand NCS, Version 2.0 that support both physical and logical ATM network management. There will also be an ATM network management application shipping with the new ATM hub.

MIGRATION

While Chipcom does have a strong mixed MAC and configuration switching hub product set today, its high-speed ATM networking strategy needs work. The company's methodology for migration to ATM in a Chipcom networking environment is as hazy as the company's new ATM hub.

Consequently, despite Chipcom's intentions to support the transition of a LAN backbone, lack of announced product capability indicates realization of this objective is still some time off. Chipcom will, however, preserve past investment in NetVIEW/6000 ONdemand NCS management software and ONline concentrator modules. The implication of this strategy, however, is that end user migration to ATM can only be realized with the purchase of a new hub and not incrementally by way of add-on modules to existing hubs. This will mean that an ATM transition will be far more expen-

Our high-volume printing solutions are packed with these 2,000 exciting features.

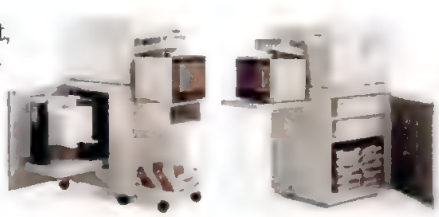
More paper going in.
The HP Paper Feeder raises your input capacity to a whopping 2,000 sheets.

More paper coming out.
The HP Output Stacker lets you print all 2,000 pages before picking up a single document.

More paper nearby.
The HP LaserJet Printer Cabinet holds your printer, paper feeder, supplies, and—you guessed it—reams and reams of paper.

There's nothing terribly exciting about stacks of paper. Except that Hewlett-Packard's paper-handling solutions for the HP LaserJet III Si, 4Si and 4Si MX printers let you spend a lot less time dealing with them. And when it comes right down to it, why *save time* with a 17-page-per-minute printer if you have to *spend more time* putting paper in and taking documents out?

The 1,500-sheet HP Paper Feeder and HP LaserJet Printer Cabinet give network users double the input capacity plus a place to keep paper — where it won't get wrinkled or dog-eared.



For unattended printing, use the HP Paper Feeder with the 2,000-sheet HP Output Stacker*. It's the ideal solution for printing big jobs after hours.

If increasing productivity sounds more exciting than refilling paper trays, talk to your HP representative or reseller. Or call 1-800-752-0900, ext. 7889 for more information.

HEWLETT® PACKARD

*Installation is required by HP authorized service personnel. © Hewlett-Packard Company 1993

CIRCLE 942 ON READER SERVICE CARD

HELLO
my name is
RON SIMONS
NETWORK
ADMINISTRATOR

FINALLY, A MAIL SYSTEM THAT REQUIRES SO LITTLE OF YOU, YOUR USERS MAY FORGET WHO YOU ARE.

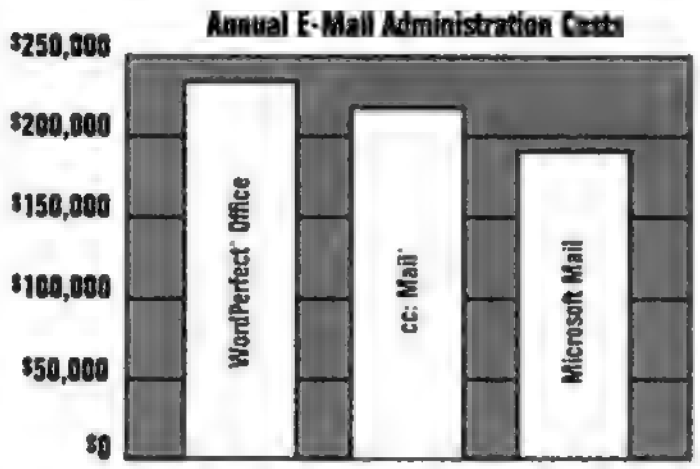
The mail must go through. And with Microsoft® Mail, it will. With hardly any effort on your part.

The easiest to set up.

Everything you need comes in one box, ready to go. Including clients for MS-DOS®, Windows™, OS/2®, and Macintosh®, as well as a gateway to AT&T® Easylink extending your mail to millions worldwide.*

What's more, a new setup program makes installing Microsoft Mail simple.

Microsoft Mail is the most cost-effective compared with other network-independent LAN-based e-mail systems.



Our new batch utility makes it easy to create new mail accounts. All it takes is a few keystrokes, and user names and files are imported from your Novell® NetWare® or Microsoft LAN Manager network directory. Even directory updates are automatically synchronized, regardless of your user's platform.

The easiest to maintain.

Microsoft Mail is easy to maintain because it's incredibly easy to use. Not only does it walk users through features so *you* don't have to, it allows you to access the system from any workstation.

It also puts everything you need to administer the mail in one program. You can create, delete or modify user accounts. And set up communication parameters for remote mail users or for our comprehensive line of gateways. You can even generate reports.

The easiest to build on.

Microsoft Mail offers a well-defined, open architecture with industry-wide support, so it's easy to build on, adding extended functions seamlessly.

And now for a limited time, you can get the Microsoft Mail Special Edition, which includes Microsoft Mail and three add-on products that make it even easier to view and manage messages.

It includes Outside In® for Windows, allowing users to view, copy, and print mail attachments; Win Rules™, an automated message management system; and Absentee Manager™, a way to set "Out of Office" messages and forward mail automatically to alternative users.

For the location of a reseller near you or to find out more about Microsoft Mail Special Edition, call today: (800) 426-9400, Department KP9.

The choice of a mail system this easy to use and maintain will undoubtedly make you popular at the office. Though, probably not particularly visible.

Microsoft

*Requires an AT&T Easylink account. Chart source: Preliminary conclusions of InfoCorp study, June 11, 1993. © 1993 Microsoft Corporation. All rights reserved. For more information: In the 50 United States, call (800) 426-9400, Department KP9; customers in Canada, call (800) 563-9048; outside the U.S. and Canada, call your local Microsoft subsidiary or (206) 936-8661. Microsoft and MS-DOS are registered trademarks and Windows and the Windows logo are trademarks of Microsoft Corporation. Absentee Manager is a trademark of Management Software Holdings Ltd. AT&T is a registered trademark of American Telephone and Telegraph Company. cc:Mail is a registered trademark of cc:Mail Inc., a wholly owned subsidiary of Lotus Development Corporation. Macintosh is a registered trademark of Apple Computer, Inc. Novell and NetWare are registered trademarks of Novell, Inc. OS/2 is a registered trademark of International Business Machines Corporation. Outside In is a registered trademark of System Compatibility Corporation. Win Rules is a trademark of Beyond Incorporated. WordPerfect is a registered trademark of WordPerfect Corporation.

sive to the end user community than it really needs to be.

SYNOPTICS COMMUNICATIONS

Of all the vendors reviewed here, SynOptics offers the most comprehensive line of hubs and ATM interfaces today. It has distributed its investments across multiple product lines, resulting in the widest set of options for building a switched LAN infrastructure today. And most importantly, it offers ATM products today.

Currently, SynOptics users are linked together through the company's midrange hub, the 2000, and its enterprise hub, the 3000. With the recent introduction of the 5000 switching hub, SynOptics now offers products in each of the critical areas: departmental, enterprise, and global.

Not surprisingly, the company's ATM strategy revolves around a similar strategy: creating products that meet the needs of each of these types of networks instead of offering a "super hub" that supports all requirements and offers backward-compatible modules, as Chipcom is offering.

For the global network, SynOptics offers two ATM switches—LattisCell 10102 and 10104—both capable of migrating from 5 Gbps to 20 Gbps. They were the first ATM switches delivered by a hub vendor.

The LattisCell switches complement SynOptics' leading hubs—the 3000 and the older 5000. The 3000 uses a single backplane that supports up to five Ethernet, two Token-Ring, and one FDDI network. Switching is provided through an independent module, the Model 3328 Switching Engine, a version of Kalpana's Ethernet switch, which allows nodes on a single module to be switched between networks.

The 5000 differs substantially from the current LattisSystem 3000 in that it incorporates multiple switching mechanisms. The 5000 also supports more LAN connections—any of which can be switched across the hub, an ATM interface, and an intrahub translation engine between the 5000 and the 3000 environments (the CelliFrame module).

While much of the advanced frame- and cell-switching services will not be available until sometime in 1994, users can begin to utilize basic LAN switching services today via the 5378 four-port Ethernet modules. These modules can connect to either end stations or other hubs via fiber.

An additional important feature of the 5000 is the presence of a 32-Mbps management bus, which has service interfaces to all data buses and switching fabrics within the 5000. The 5310 Management Modules are also unique in that they support a daughterboard interface onto which individual data-collection engines (DCEs) are placed for the purpose of performing more extensive LAN management and traffic monitoring than is possible today using more conventional software-based technologies.

Of all the vendors reviewed here, SynOptics offers the most comprehensive line of hubs and ATM interfaces today.

In addition to providing monitoring of on-board modules, a DCE is also viable in that it can monitor frame traffic from a System 2000 or 3000 hub that is connected to the 5000. This is possible because DCEs directly utilize the Ethernet, Token-Ring, and FDDI data bus in the 5000 for data gathering rather than the management bus. Consequently, most any connection, including those downstream, can be monitored at full channel speed by a DCE.

COMPLEMENTS OPTIVITY

This system architecture complements the new set of services that are available for Optivity, Version 4.0 for virtual LAN management. While most of the functionality of the Optivity interface will not be fully realizable until later this year, basic services that support the four-port Ethernet cluster module can allow a user to get started today while establishing the foundation for a more full-featured service rollout over the next year. The object metaphor is supported by a set of hierarchical views (such as Network Center View, Nodal View, and LAN Resources View), which will allow end users the means to both easily effect virtual LAN configuration changes as well as to map the logical topology to the organizational structure of their enterprise more closely.

The lack of LAN technology dependence allows users to gain familiarity with this structure in the context of familiar LAN technologies while providing the means to realize the benefits of ATM technology as local requirements dictate more quickly.

CLOSE, BUT NOT COMPLETE

Still there is a significant portion of this strategy that needs to be provided: The optimization of Optivity features with respect to switched legacy LAN technology without a corresponding strong message about how these switched LAN services between hubs can be effectively managed by Optivity when they transition to ATM technology. SynOptics is currently working on further definition of this particular set of management services.

What's more, there is currently no direct ATM interface for departmental hubs. Nor does the 5000 perform frame-cell conversion. However, given projected trends regarding end user ATM transition along with the related deployment of switched and virtual LAN technology, SynOptics' targeted time frame does not in any way put it at a competitive disadvantage with respect to meeting anticipated demand.

As with any new standard, ATM will face significant challenges. Competition from other high-speed standards will pose significant hurdles for ATM vendors. But with such great capacity, flexibility, and vendor support, it's hard to imagine that your future networking plans won't be affected by ATM.

Our Contributors: NICK LIPPIS is a contributing editor of *PC Magazine* and president of Strategic Networks Consulting, a consultancy specializing in enterprise networking. JOHN MORENCY is a principal at Strategic Networks.

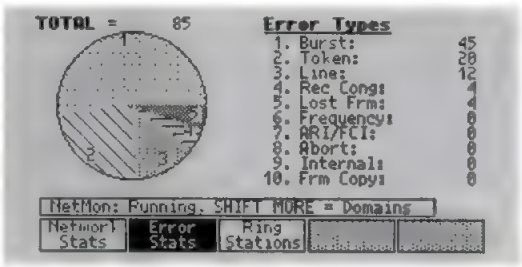
When your network isn't healthy, you need information, not just symptoms. "File Server Not Found", slow network response, or dropped connections don't tell you what's *really* wrong.

What?

Where?

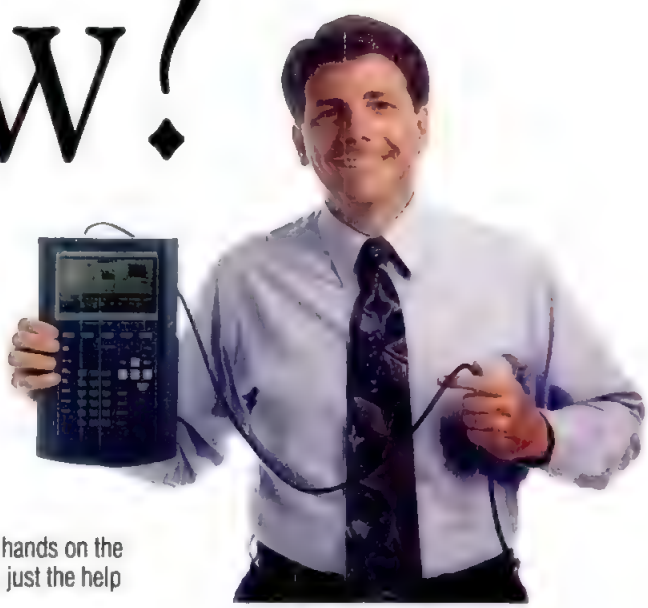
The biggest problem with network trouble is there are so many places where the fault could be. Fixing them is often the easy part. *Finding* them is what takes up valuable time.

Whether **it's an overloaded server, a marginal cable, a faulty NIC card or MAU, the 670 LANMeter shows you what's wrong, in detail. In seconds.** And it often suggests other tests to further isolate the problem.



Why?

How?



New: 670 TOKEN RING LANMeter™

Take control of your network with Fluke's 670 LANMeter. The LANMeter automatically inserts into your Token Ring – even on sick or dead networks – at the correct ring speed so you can identify problems like beaconing, ring errors, and wire faults when and where they happen.

It only takes 30 minutes to learn how to use the 670 LANMeter, including unique features like Expert-T autotest, phase jitter measurements, and real-time graphic analysis.

You'll be glad you got your hands on the 670 LANMeter from Fluke. It's just the help you've been waiting for.

Call 800-44-FLUKE for an "eye-opening" demo of the LANMeter in action and our special *Troubleshooting Guide.*

© Copyright 1993 John Fluke Mfg Co., Inc. P O Box 9090, M/S 250E, Everett, WA, USA 98206-9090
U.S (206) 356-5400 Canada (416) 890-7600
Europe (31 40) 644200. Other countries (206) 356-5500.
All rights reserved. Ad No. 00400.

Tools for Healthier LANs

FLUKE

CIRCLE 925 ON READER SERVICE CARD

DigiBoard Is Your Best Connection To Remote LANs.

DigiBoard brings remote LANs closer together. Whether you have an outside salesforce that needs access to data, road-bound executives that need their E-MAIL, or satellite offices that need to communicate on a regular basis, DigiBoard can help you make the connection. Anywhere in the corporate network. Anywhere in the world.

Wherever There's a Phone Line... You Can Extend Your LAN.

DigiBoard remote communication products install easily and provide high-speed connectivity through standard or digital (ISDN) phone lines. In fact, you can choose from a wide variety of products and connect over 1000 users through a single server without degrading performance. With DigiBoard, anywhere there's a phone line you can extend the corporate LAN.

DigiBoard Makes Your World a Little Smaller and a Lot More Profitable.

As your world gets smaller, DigiBoard's intelligent serial boards can help make it more profitable. With an onboard front-end processor, these boards off-load processing requirements from your host CPU. This keeps host performance high while eliminating data loss caused by host interrupts. And our unique architecture provides transmission speeds faster than standard serial ports. This reduces transmission time and lowers phone bills. All of which keeps performance high, overhead low, and saves you time and money.

High Speed Ports for Remote Access

DigiBoard provides a range of connectivity solutions from adding a single user to creating a corporate communications hub. Choose from intelligent serial ports (asynchronous for standard or synchronous for X.25 communications) and ISDN products.

Here's How You Make the Right Connection.

Just call DigiBoard for a FREE pocket guide. Ask for either The Pocket Guide to Extended LAN Access Solutions or The Pocket Guide to ISDN LAN Extensions. Or talk to a product specialist for additional information.

Call 1-800-551-4797

DigiBoard
The Smartest Connection You Can Make

DigiBoard U.S.A (800) 344-4273 • (612) 943-9020 • FAX (612) 943-5398 • European Office TEL 49 2203 81083 • FAX 49 2203 85692 • E-MAIL uunet!digibd!info or info@digibd.com

© 1993 Digi International Inc. All rights reserved. All brand names and product names are trademarks or registered trademarks of their respective holders.

CIRCLE 854 ON READER SERVICE CARD

FIRST LOOKS

HANDS-ON EVALUATIONS OF THE NEWEST NETWORK PRODUCTS

▶ NETWORK MANAGEMENT

HP OpenView for Windows Changes With the Times

BY JEFFREY D. BAHER

Like PC networks themselves, the Windows-based network management market is rapidly maturing. Fueling this surge is Hewlett-Packard's latest version of HP OpenView for Windows. Like previous revisions, Version 7.1 of the platform is available only through OEM channels. Unlike previous versions, Version 7.1 establishes OpenView as both a powerful and flexible network management platform.

HP also recently introduced a set of applications that run on the OpenView platform, including ProbeView/SNMP, Version 1.0, HP's sleek RMON MIB management console. Third-party applications are also available, though the platform would benefit from broader support.

HP OpenView for Windows began shipping in 1988. Since then, the platform has only been available as part of various application bundles. Cabletron and SynOptics, for example, include it with Remote Lanview for Windows and LattisNet Manager for DOS, respectively. While use of such distribution channels has kept the OpenView name somewhat obscure, OpenView has accrued the largest installed base of any network management platform—Windows or Unix.

Unlike previous versions, Version 7.1 is not just a backdrop for other applications. New features such as an enhanced graphical user interface, IP and IPX auto-discovery and auto-mapping, and an SNMP manager enable the platform to play a more prominent role in the integrated network management process. Version 7.1 is HP's attempt to deliver a management solution that matches today's complex multisegment, multiprotocol LANs.

HP OpenView: New Features Of Versions 7.0 and 7.1

- [illegible]
- Simultaneous display of multiple network submaps
- Alarm manager for alarm filtering, sorting, and history reporting
- IP/IPX auto-discovery and auto-mapping
- [illegible]
- Application Builder based on Microsoft Visual Basic (optional)

The new IP and IPX auto-discovery and auto-mapping features are key to its success. As their names imply, these features automatically discover networked IP or IPX devices based on router Address Resolution Protocol caches for IP discovery and NetWare servers for IPX discovery. Once the devices are discovered and stored in the OpenView database, the auto-mapping tool creates a hierarchical view of the network. Together, these two features provide an added element of convenience, but they also help to reduce drastically the time needed to construct network topologies. Especially on heavily populated LANs, the amount of time required to discover and map network devices manually can be staggering.

After the network has been discovered and mapped, HP OpenView for Windows 7.1's SNMP manager can be used to define and execute SNMP queries. Queried data can be displayed in either table or graph format. The graphing capabilities are particularly helpful when querying continuously changing information such as packet statistics. Overall, the SNMP manager is an effective manage-

Continues on page NE14

▶ REMOTE ACCESS

Novell Provides a Single Platform For Multiple Remote-Access Needs

BY STEVE RIGNEY

Typically, remote access to a network requires the use of multiple hardware and software products. Remote-node and remote-control access, for example, are generally handled by separate, dedicated PCs. NetWare Connect, which provides a single network platform for all of your remote-communications needs, can help consolidate your remote-access configuration.

NetWare Connect, Version 1.0, ranges in price from $595 for a 2-port version to $5,995 for a 32-port version. It consists of NetWare Loadable Modules (NLMs) that you can run either on a NetWare 3.*x* or 4.*x* file server or on a dedicated PC communications server using a runtime version of NetWare. It also includes serial port–redirection software, which allows client PCs to access network modem banks.

NetWare Connect's Remote Node

Continues on page NE18

Hewlett-Packard

CONTINUED FROM NE13

ment tool, though there is some room for improvement in the graphing and reporting capabilities. SNMP queries, for example, can be printed but not saved.

For advanced network analysis and segment statistics based on the RMON MIB, HP offers ProbeView/SNMP, Version 1.0. ProbeView installs under HP OpenView for Windows 7.1, and its functions are available under OpenView's Monitor menu heading. ProbeView works with HP's LanProbe2 RMON probes, which are available for Ethernet or Token-Ring and track network activity as specified under the RMON MIB.

On the OpenView platform, ProbeView offers three active menu selections: Statistics, Alarms, and Stations. A fourth selection, Packet Capture, is available with the purchase of the Packet Capture/Protocol Decode add-on.

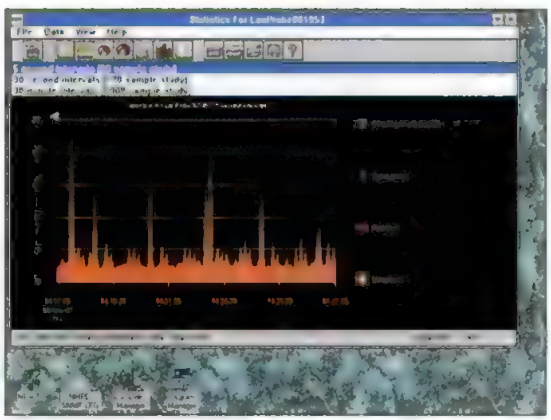
Statistics, based on the RMON History subgroup of the RMON MIB, presents network traffic statistics based on polling intervals of 5 seconds, 30 seconds, or 30 minutes. This function is intended to provide trend analysis based on a wide range of user-selectable statistics including number of packets, broadcasts, multicasts, and collisions. Statistics not only provides useful statistical information, but it does so with an eye for aesthetics. HP may have cut corners with the graphing capabilities in the SNMP manager, but not with ProbeView. Simply put, the presentations are dazzling.

The Stations function provides basic statistics for individual nodes.

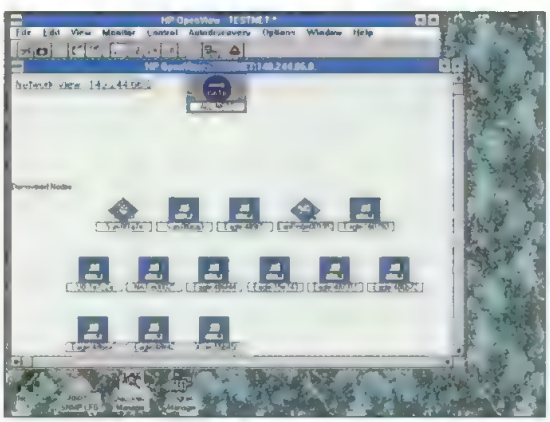
The Alarms function allows you to set thresholds and alarms based on RMON variables so that you can alert the network manager of certain events or traps.

Like the rest of ProbeView, the optional Packet Capture function combines ease of use with excellent presentation. The Protocol Decode function in particular is extremely effective in presenting low-level packet-decoding information. For security reasons, not all ProbeView customers want this function, so HP offers it as a $1,500 option. For those who are interested in protocol analysis, though, the investment is worth it.

A variety of other HP and third-party applications are also available for HP OpenView for Windows, including HP OpenView Interconnect Manager and HP OpenView Workgroup Manager for HP hub, bridge, router, and printer management as well as traffic analysis. HP also offers support for HP NetServer Assistant and HP OpenView System Manager for management of HP's Intel-based servers and minicomputers, respectively.



STATISTICALLY SPEAKING: ProbeView tracks and reports on a wide range of network statistics.



NETWORK ROAD MAP: OpenView's auto-discovery and auto-mapping features generate easy-to-read network maps.

Other vendors have announced support for the Version 7.1 platform as well. Cabletron and SynOptics will continue to support the platform, while Intel announced a joint marketing venture with HP to bundle Version 7.1 with LANDesk Manager. Additionally, messaging software manufacturer Ex Machina, maker of Notify!, announced plans to integrate Version 7.1's Alarm manager with Notify!'s wireless network event–notification capabilities. Remedy Corp. also recently announced plans to support Version 7.1 by porting its Action Request System, a trouble-ticketing application, to the platform.

Despite the fact that the OpenView platform is gaining industry support, however, the lack of key third-party applications is noteworthy. Cisco's CiscoWorks and Wellfleet's SiteManager are not supported. To stimulate third-party development, HP announced Application Builder, based on Visual Basic, which should help foster development, but the end user must wait for the application base to grow.

OpenView's main competitor, Novell's NMS 2.0, provides an alternative solution to LAN management, though it takes a NetWare-centric approach, relying heavily on communication with the NetWare server. For NetWare shops, OpenView and NMS will most likely compete heavily, but for the remaining sites, OpenView should achieve greater success, especially with increased third-party support.

Especially for LANs that don't use NetWare, HP OpenView for Windows is a great purchase. Even in NetWare environments, where NMS 2.0 has established its base, OpenView is a good choice for network managers. Increased third-party support and forthcoming distributed management capabilities based on tighter integration between the Windows and Unix versions of HP OpenView will add to its appeal.

• List price: *OpenView for Windows, Version 7.1, bundled in various network management packages (not available separately); HP OpenView for Windows 7.1 Developer's Kit, $2,500; Application Builder, $1,000; HP 4988A ProbeView/SNMP, $3,500; Packet Capture/Protocol Decode, $1,500; LanProbe2 Ethernet, $2,795; LanProbe2 Token-Ring, $2,995. Hewlett-Packard Co., 5301 Stevens Creek Blvd., Santa Clara, CA 95052; 800-554-1305; fax, 408-553-2909.*

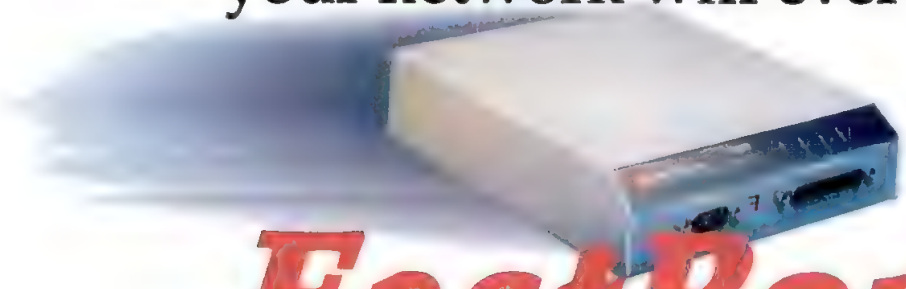
Circle 963 on reader service card

COMNET '94
See us at
Booth #2802

MiLAN

Now with LPD diskless set-up.

The ONLY print server your network will ever need!



FastPort

Simultaneous print sharing for heterogenous computing environments.

UNIX **NetWare®** **EtherTalk®**

Your network is constantly changing. And any product that can adapt to change will make your life easier. Especially when it comes to sharing costly peripherals in multi-protocol environments.

MiLAN's FastPort Series 3000X and 3100X multi-protocol Ethernet print servers allow you to place printers, and plotters anywhere UNIX, NetWare or Macintosh users might need them.

All three protocols print simultaneously through FastPort's serial and parallel ports.

Your users demand enhanced network perfomance. Direct support of the popular UNIX lpd utility allows virtually "plug and play" installation through FastPorts twisted pair, thinnet and thicknet connections Fastport provides you with the speed you need with more than 130 K bps of sustained data transfer – more than enough power to drive high–speed, high–quality color printers and plotters to the limit.

And the FastPort is the only print server that allows Macintosh users to print large PostScript™documents through the parallel port of most laser printers making sluggish serial port printing a thing of the past.

You'll find everything you need in the FastPort Series multi-protocol print servers. So don't settle for anything less than a total solution...

Call today for the dealer nearest you.

800-GO-MiLAN

408.752.2770
Fax: 408.752.2790
E•Mail: info@milan.com

MiLAN TECHNOLOGY

MiLAN TECHNOLOGY
894 Ross Drive, Suite 101
Sunnyvale, CA. 94089 - 1443
U.S.A.

FastPort is a tradename of MiLAN Technology © 1993 MiLAN Technology Corporation All other product names are trademarks of their respective companies.

CIRCLE 879 ON READER SERVICE CARD

Putting Imaginatio

© DIGITAL is (c) Digital Equipment Corporation, 1994. Digital, DEClaser, DECnet, OpenVMS, PrintServer and the DIGITAL Logo are trademarks of Digital Equipment Corporation. PCL is a registered trademark of Hewlett-Packard Company. LAN Manager is a trademark of Microsoft Corporation. PostScript is a trademark of Adobe Systems Inc. NetWare is a registered trademark of Novell, Inc. UNIX is a registered trademark of UNIX Systems Laboratories, Inc. OSF/1 is a registered trademark of the Open Software Foundation, Inc.

Imagine A Family Of Printers You Can Build Any Size Network Around.

No matter what type of network you have – Ethernet or Token Ring, NetWare™ or LAN Manager,™ Unix,® OSF/1,® Windows NT™ or Open VMS™ – one family of printers towers above all the rest. Network printers from Digital. A complete family that truly has been designed to handle anything. From our affordable Adobe PostScript™ Level 2 desktop printers to the high-performance power of our PrintServer systems, there's a Digital printer that's built for your network. And built to last. Reliably delivering page after page of superb print quality. How can you get the full story on the Digital network printer that's right for you? Just get on the telephone. And call us direct or ask for the name of your local distributor. Call **1-800-777-4343.**

Network Printers From Digital. Designed to Handle Anything.

DEC Laser 1152 Includes
- 4ppm, 300 x 300 dpi
- 17 resident PostScript fonts
- Adobe PostScript L2, PCL4 support
- Up to 4MB RAM

PrintServer 17/600 Includes
- Ethernet-DECnet & TCP/IP support
- 17ppm, 600 x 600 dpi
- 43 resident PostScript fonts
- 16MB RAM
- Adobe PostScript L2, PCL5 support

PrintServer 32 Includes
- Ethernet-DECnet & TCP/IP support
- 32ppm, 300 x 300 dpi
- 29 resident PostScript fonts
- 12MB RAM
- Adobe PostScript

To Work

digital™

CIRCLE 931 ON READER SERVICE CARD

Novell

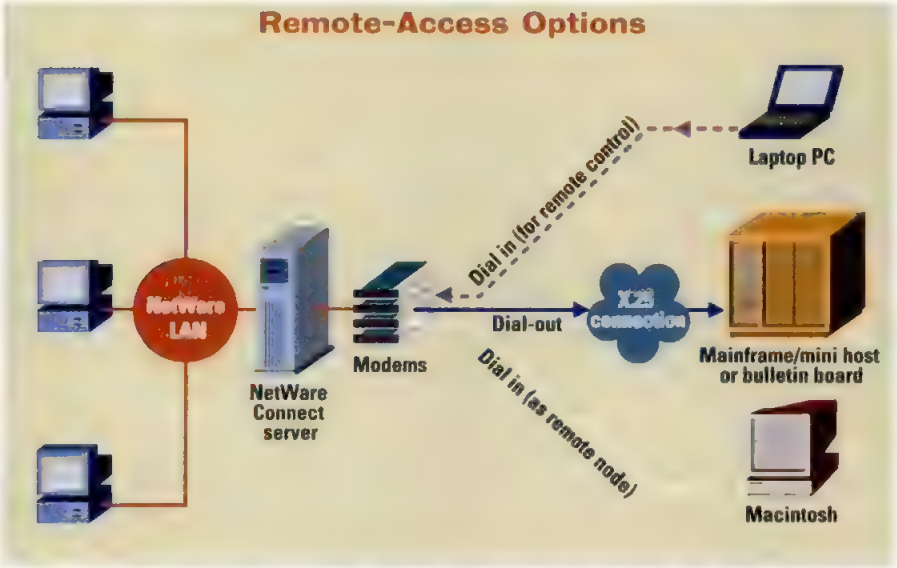
CONTINUED FROM NE13

Service (RNS) provides PC users with remote-node access to a NetWare network and supports drivers for NetWare Remote Node (NRN) ODI LAN for DOS, NRN ODI LAN for Windows, and AppleTalk Remote Access Protocol for Macintosh computers. A remote user can connect to the network by loading NRN and the NetWare drivers and shell on their laptop or desktop computer. The RNS/NRN interface acts as a client-to-LAN router. Unlike other router-based remote-node products such as the Shiva LanRover/E, NetWare Connect does not use the Point-to-Point router protocol or proxy IPX for transferring data across the phone line. Novell developed a streamlined IPX packet for NetWare Connect that increases the throughput on a dial-up connection.

NetWare Connect also includes an NLM for Apple's Remote Access Services (ARAS) that runs on the NetWare Connect server, providing remote-node access for Macs running AppleTalk Remote Access. If your Macintosh users need to send and receive data files, you will also need to install NetWare for Macintosh.

You can use the NetWare Asynchronous Services Interface (NASI) Connection Service (NCS) in NetWare Connect to provide both remote-control dial-in and network dial-out communications. NCS works with Novell's NetWare Access Server and third-party network remote-control packages such as Symantec's Norton pcAnywhere and Triton's CO/Session, and to allow you to control any PC on the network remotely via the server's modem connections.

When you configure your remote-control package or other communications software on the networked PCs, you must set the program's communications port to NASI so the NetWare Connect client software redirects the communications port across the network to one or more modems connected to the NetWare Connect server. Earlier versions of Novell's NASI redirection software assigned your communications port to an individual network modem. The new NCS assigns your communications port to a database that contains information about the modem or bank of modems attached to your NetWare Connect server. This database monitors each modem's status and ensures that each is functional. NetWare Connect supports standard asynchronous modems, X.25 packet networks, and ISDN connections.



The NetWare Connect server includes an Intelligent Service Selector that can distinguish between incoming RNS, ARAS, and NCS calls. The Intelligent Service Selector allows you to use any port and modem for any type of connection without assigning specific ports to specific users. Unlike other remote-access products, NetWare Connect is not concerned with the type of modem, but only with the type of call.

Like other software-only remote-access products, such as Digital Communications Associates' Remote LAN Node and Stampede Technology's Remote Office, NetWare Connect requires you to build your own access server, a feat that can take hours of fiddling with interrupt requests, addresses, and cables. Fortunately, NetWare Connect offers support for dozens of I/O cards and network adapters in addition to setup strings for nearly 100 different modems. If you have a modem that NetWare Connect does not recognize, you will have to contact Novell representatives and work with them to establish a working configuration. Novell is currently working with several hardware vendors including Cubix Corp. and J&L Information Systems to develop turnkey NetWare Connect servers.

NetWare Connect offers security for tracking both dial-in and dial-out users. You can control access to individual ports with user names and groups. The program takes all user names and passwords from NetWare's bindery. NetWare Connect also provides an audit trail for tracking individual and port usage. A dial-back feature is available for increased security.

NetWare Connect's most appealing feature is its expandability. Novell is developing a set of APIs that will allow third-party vendors to develop products for the NetWare Connect platform. By following this architecture for NetWare communications, vendors can develop e-mail, network fax servers, and other remote-access products to work seamlessly with NetWare Connect.

If you are only concerned with solving your remote-node, remote-control, or dial-out communication needs today, you will probably find a simpler and easier-to-install hardware solution in the Shiva LanRover or the U.S. Robotics Communication Server. If you are building a complete dial-in and dial-out platform for the future, however, NetWare Connect offers the convenience of a single platform with room for growth.

• List price: *NetWare Connect, Version 1.0, $595. Novell Inc., 890 Ross Dr., Sunnyvale, CA 94089; 408-747-4000.*

Circle 961 on reader service card

Uninterruptible power, unbeatable reliability, unbelievable price...

Makes a great Christmas gift!

Now the best value in server protection starts at just $229!

READERS CHOICE 1992 · READERS CHOICE 1993 · READERS CHOICE 1994 · READERS CHOICE 1995

APC has won more awards th UPS vendors combined... includ consecutive LAN Times Reader's Awards.

yes NetWare Tested and Approved

Back-UPS® Uninterruptible Power Supplies are powerful server protection you can't afford to be without. No more downtime. No more dataloss. Just smooth power at a price that will keep you in the black.

More than 1,000,000 customers now count on Back-UPS for unmatched reliability. When combined with PowerChute auto shutdown software (sold separately), Back-UPS can even initiate an automatic, unattended server shutdown during an extended power outage and prepare your LAN to reboot automatically when utility power returns. PowerChute is now available for all popular operating systems, including Windows NT.

Model	Application	Sugg. List
BK250	LAN nodes, internet hardware, POS	$139
BK400	Desktop 486, 386 systems, servers	$229
BK450	Tower 486, 386 systems, servers	$279
BK600	Heavily configured systems, CAD/CAM workstations	$399
BK900	Multiple systems, longer runtime applications	$599
BK1250	Multiple systems, LAN hubs, small minis, telecom equipment	$799

© 1993, APC. Back-UPS, PowerChute are trademarks of APC. Other trademarks are the property of their owners.

MICROSOFT WINDOWS COMPATIBLE

Best of all, Back-UPS are so cost-effective, you can add reliability to your entire LAN by protecting database servers, print servers and communication servers too. In addition, you can increase system fault tolerance by protecting internet hardware, including routers, bridges, repeaters, concentrators and hubs.

If you already have aging UPS's installed, you can trade them in for Back-UPS under our Trade-UPS program! So call for your free handbook today. Or better yet, buy a Back-UPS 600, 900, or 1250 and **for a limited time we'll give you PowerChute Software FREE!**

CIRCLE 915 ON READER SERVICE CARD

FREE PowerChute® software... with the purchase of a Back-UPS

☐ **YES,** I've purchased a Back-UPS 600,900 or 1250 and have enclosed this coupon and a copy of my invoice. I'd like PowerChute for (check one)

☐ Novell ☐ OS2, LAN Manager, LAN Server
☐ Unix/Xenix ☐ AppleShare
☐ HP-UX ☐ DEC VAX/VMS ☐ Windows

☐ **NO,** I haven't purchased a Back-UPS yet, but I would like to receive a free Power Protection Handbook.

Name: .....
Title .....
Company: .....
Address: .....
Phone: .....
UPS brand currently used .....

APC
AMERICAN POWER CONVERSION

800-800-4APC . DEPT. E4

APC EUROPE (+33)64625900/ASIA/PACIFIC FAX 401-789-1631
L. AMERICA FAX 401-788-2716/Compuserve: GO APCSUPPORT

*Original coupons only. Offer expires 2/1/94, coupons must be received by 2/15/94. This offer applies to Back-UPS purchased between 10/1/93 and 2/1/94, an invoice that falls between these dates must accompany coupon. Limit one per site. Quantities designated for this offer are limited. Not valid in conjunction with any other offer.

You'll find the be from a compa Just not the

■ Innovative. Leading-edge. Completely foolproof. These may not be the first words that come to mind about Token Ring networks.

But now they can be.

Just look for the products that come with three letters — no, not those three letters, these three letters: 3Com.®

3Com's Token Ring solution for the workgroup — including adapters, hubs, and management — improves the performance of your Token Ring network with a series of technological innovations found only with 3Com.

The innovation starts with full network management capabilities for all 3Com TokenLink® III adapters and LinkBuilder® TR Series stackable hubs.

Only 3Com offers fully-implemented RMON for a network analyzer level of management for its Token Ring hubs, providing in-depth troubleshooting tools such as alarms, historical error and traffic analysis, and packet capture with advanced filtering capabilities, among others. No other Token Ring hub offers greater troubleshooting capabilities than 3Com's LinkBuilder TR Series hubs.

Add 3Com adapter management and you can manage down to the desktop to identify and isolate errors on your network, track hardware, and even generate graphical reports.

What's more, 3Com's Phased-Locked Loop technology allows you to carry more robust signals over longer distances with new or existing wires, and will support up to 256 users per ring. And because you can carry clear signals over lower grades of wiring, complete re-wiring of the building is unnecessary.

3Com's LinkBuilder TR Series hubs even prevent network downtime by locking out faulty users *before* access is gained to the network.

Couple this with the highest-performing, 100 percent IBM®-compatible TokenLink III adapter

©1993 3Com Corp. (408)764-5000. 3Com, Networks That Go the Distance, LinkBuilder, and TokenLink are trademarks of 3Com Corp. IBM is a registered trademark of International Business Machines Corp.

st Token Ring performance
ny with just three letters.
three you're thinking of.

family that comes with a money-back guarantee for compatibility and a lifetime warranty, and you get a measure of performance found in no other Token Ring product line. And that's just for starters.

But why not see for yourself? Just call us at **1-800-NET-3Com** for complete information on our specially priced Token Ring Bundle for the workgroup, and 3Com's full line of Token Ring adapters, hubs, network management and bridge/routers. And learn why there's another three-letter choice for your Token Ring network.

3Com®

Networks That Go the Distance™

CIRCLE 874 ON READER SERVICE CARD

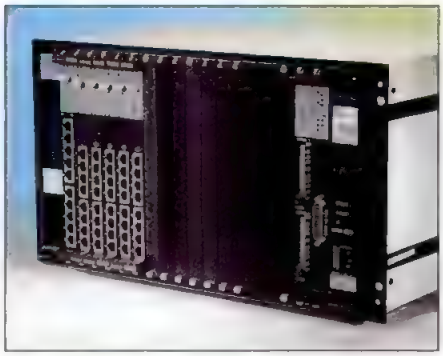
ETHERNET SWITCH

Lannet Joins the Switching Market

BY O. RYAN TABIBIAN

JMore and more hub vendors are offering Ethernet switching as part of their overall enterprise solution and are flooding the market with a flurry of new products. One of the most recent entries into this growing market is the Lannet LanSwitch 208 Module for the MultiNet II enterprise hub line. The 208 provides good performance and a unique Congestion Management feature that prevents packet loss during heavy network activity. While the 208 proved to be a capable switch, however, it is more expensive than standalone switches and faces stiff competition from the other enterprise hub vendors.

Now that Ungermann-Bass has released the DragonSwitch for its Access/One enterprise hub and SynOptics has integrated a Kalpana switching module into its LattisNet System 3000 product line, the switching market and the enterprise hub market are more closely linked than ever before. For this reason, the quality of the switch is a product of not only its own features, but those of the hub as well.



FOR THE ENTERPRISE: The MultiNet II, with the 208, provides a good enterprise hub solution.

The 208 provides a unique feature called Congestion Management that is not offered by other switches. Congestion Management prevents packet loss by slowing down the flow of packets into the switch from network clients if the packets are being sent faster than the module can handle. The feature proved effective in testing: The 208 did not drop any packets even when we saturated a 10-Mbps collision plane with four 10-Mbps streams.

The 208 is not without its faults, however. Most Ethernet switches provide multiple 10-Mbps collision planes to enhance performance. For example, the standalone Kalpana EtherSwitch EPS-1500 and the Ungermann-Bass DragonSwitch each offer a dedicated 10-Mbps channel for each port on the switch. The 208, however, offers only two channels for a total of eight ports.

Additionally, most Ethernet switches support multiple media-access control (MAC) addresses. However, the 208 can support only 16 MAC addresses per module, considerably less than that offered by either the DragonSwitch, which supports up to 1,024 MAC addresses per module, or the EPS-1500, which can support an astronomical 1,700 MAC addresses per port. While 1,700 is generally too many addresses for any one device to support, 16 is far too few. The low number supported by the 208 precludes network administrators from being able to attach a standard hub to one of the ports, since that hub will contain more than 16 addresses.

We used the Alantec Powerbits to test the 208. The Powerbits is a multichannel network testing tool designed to send and receive packets at the theoretical maximum Ethernet wire speed (10 Mbps) with different frame sizes ranging from 64 to 1,518 bytes. We used scripts developed by Scott Bradner of Harvard University to set the testing parameters for the Powerbits.

Instead of running the NIC Throughput Test from NetBench 2.1 as we would for an adapter, we tested the 208's ability to handle multiple Ethernet streams, measuring packet loss in much the same way we would for a router. The

CIRCLE 932 ON READER SERVICE CARD

208 performed admirably, handling all of the traffic loads at the theoretical maximum throughput—without any packet loss.

Despite the strong performance, however, the best reason to use the 208 switch may be the $4,000 MultiNet II chassis-based hub, which features a passive 20-Mhz bus with a 64-bit bus path, providing a theoretical maximum throughput of 1.28 gigabits per second. Comparatively, the Access/One utilizes a 16-bit bus and supports a maximum theoretical throughput of 320 Mbps. At present, the high-speed backplane may be overkill for most LANs, but the MultiNet II offers a great deal of potential for the future, once Lannet provides modules that effectively utilize the backplane.

The 208 is more expensive than standalone switches, but is a good choice for those looking to incorporate switching into an enterprise hub solution. However, the 208's relative shortcomings, such as limited MAC address support, may turn potential users away from the MultiNet II and towards Ungermann-Bass' Access/One or SynOptics' System 3000.

• List price: *Lannet LanSwitch 208 Module, $2,995. Lannet Data Communications Inc., 7711 Center Ave., #600, Huntington Beach, CA 92647; 714-891-5580; fax, 714-891-7788.*

Circle 962 on reader service card

▶ MODEM / ETHERNET ADAPTER

Connectivity Without Removing the Cover

BY STEVE RIGNEY

PC-equipped "road warriors" typically need to gather a multitude of tools in preparation for a trip. It seems the *minimum* personal arsenal includes a laptop PC, a fax modem, a cellular phone and, in many cases, an external LAN adapter or docking station. Xircom's $699 Pocket Ethernet Modem combines the most crucial tools—an external Ethernet adapter, a 14.4-kilobit-per-second (Kbps) data modem, and a 9.6-Kbps fax modem—in a single, low-profile unit that attaches to your PC's parallel port.

Standard serial modems use a Universal Asynchronous Receiver/Transmitter chip (UART) to control the flow of data between the PC and modem. Unfortunately, even the most capable provide only a 16-byte buffer. When a fast modem and data compression pour in data at rates of over 50 Kbps and the PC's CPU is busy writing to the disk or answering calls from Windows, incoming data can overwrite older data in the buffer. This condition results either in slow throughput or an accumulation of errors that causes a file transfer to fail.

Because the Pocket Ethernet Modem connects to your parallel port, it's not limited by the restrictions of the serial UART chip. Instead of sending each character as a string of bits, the parallel port moves entire bytes across the connection, eliminating the bottleneck at the PC.

This modem is also an Ethernet adapter that includes drivers for NetWare, VINES, Microsoft LAN Manager, and Digital Pathworks, among others, and either a BNC or RJ-45 connector. While the network throughput it provides is typically slower than what an internal adapter would provide, it is acceptable for most tasks.

COMPACT CONNECTIVITY: Combines an Ethernet adapter and a fax modem in a single unit.

The unit includes what Xircom refers to as a *phantom* power connector for the PS/2-style, 6-pin mouse port so you don't need battery or external power. You can attach your mouse to the pass-through connector. Xircom includes a standard AC power cable for PCs with no mouse port.

One of the nicest features of the product is that the modem and the Ethernet adapter can work simultaneously. You can download a file from CompuServe directly to a network drive with no noticeable decrease in network or modem performance.

The modem includes a fax communication program called QuickLink II, but you can use the modem with any DOS or Windows-based communications program with a few limitations. The good news is that Windows-based communications software works fine. Using DOS-based communications software is a bit trickier: Without Windows, you can only use this software if you are *not* using a memory manager. With Windows, you can use a memory manager, but you can only run DOS communications applications under an MS-DOS Prompt window. Otherwise, you will have to use the QuickLink II program for all of your DOS-based communications. Future releases will eliminate this problem.

In our tests, we used an external 14.4-Kbps modem on a PC with a slow 8250 UART and downloaded several files from a local BBS. When we tried to use a connection speed faster than 9.6 Kbps, we received errors and had to abort. We used the Xircom on the same PC and were able to download the same files at 14.4 Kbps. In fact, the V.42bis compression provided throughput of over 30 Kbps.

Xircom developed the Pocket Ethernet Modem mainly for notebook users, but anyone who wants a high-speed modem connection and LAN access without taking the cover off a PC will like this device. Still, if you're tied to DOS, wait for Xircom to resolve the incompatibilities. If you're using Windows, it's an excellent solution for bringing the combination of fax modem capabilities and LAN connectivity to your PC.

• List price: *Xircom Pocket Ethernet Modem, $699. Xircom Inc., 26025 Mureau Rd., Calabasas, CA 91302; 818-878-7600; fax, 818-878-7630.*

Circle 953 on reader service card

Announcing

CORELSCSI NETWORK MANAGER

Seven years of experience in developing powerful SCSI software, a commitment to our customers' needs and our all-in-one philosophy have made us a leader in SCSI software products. By listening to your needs, we have created a complete solution that has the power to meet the demands of MIS managers now and in the future. New CorelSCSI™ Network Manager is the best way to connect **CD-ROM, WORM, rewritable and multifunction optical drives and jukeboxes** to your NetWare® file server, and features:

Speed!

High Performance CD-ROM Server Software

CorelSCSI Network Manager includes optimized CD-ROM Server software with caching to give industry-leading performance. Also includes support for multi-session and Kodak Photo CD formats, as well as device drivers for the Pioneer multi-disc unit.

Security!

RAID Levels 4 and 5 Software

CorelSCSI Network Manager also includes CorelRAID,™ which allows users to customize RAID level 4 and 5 arrays with any supported ASPI-compatible SCSI controller(s) and 3 or more SCSI hard drives. Status screens allow the system administrator to easily troubleshoot any potential problems. CorelRAID lets users build arrays that provide high fault tolerance while improving performance. With CorelRAID there is no down time. By using hot-swap or hot-standby features, server down-time is eliminated.

COREL RAID™ *The Software Solution for Data Security!*

Capacity!

Advanced Jukebox Support

Users will find increased storage capacities and enhanced performance as CorelSCSI Network Manager transparently integrates optical jukeboxes with NetWare file servers.

Compatibility!

Compatible with Leading Host Adapters

CorelSCSI Network Manager includes ASPI Managers for Always Technology, Future Domain, and DPT, and supports a variety of host adapters including various models from:

CorelSCSI works with hundreds of leading manufacturers' SCSI devices. Corel ensures this with our in-house CorelSCSI Product Certification Program. Our listing of supported devices is updated monthly and is available through our fax back system, BBS, and customer service department.

CORELSCSI™ APPROVED PRODUCT

For upgrade information or to order, call Corel: ext.32

1-800-772-6735

OEM Sales (613) 728-0826 ext.1051

yes NetWare Approved

CIRCLE 908 ON READER SERVICE CARD

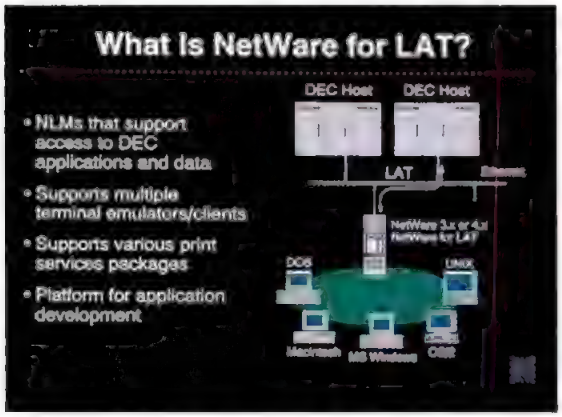
NEW & IMPROVED

NEWS OF ANNOUNCED NETWORK PRODUCTS AND UPGRADES

NEW

Novell Provides NetWare-to-Digital Connectivity Solution

The ability to connect to a variety of hosts is extremely important for today's enterprise network users, which is why Novell has released NetWare for LAT—its latest move to bring Digital users into the NetWare fold. NetWare users can now connect to Digital systems (with NetWare for LAT) as well as to IBM and Unix systems (with NetWare for SAA and LAN WorkPlace).



ENHANCED CONNECTIVITY: Supports multiple terminal emulators/clients.

NetWare for LAT lets NetWare users access Digital and NetWare services anywhere on the network simultaneously and transparently. It also obviates the need to install and maintain separate protocol stacks on each client that wants to connect to the Digital host.

NetWare for LAT uses Novell's IPX/SPX or standard TCP/IP protocols. It allows a total of 128 users to access Digital applications and data over any NetWare-supported topology, including Token-Ring, Ethernet, and ARCnet. NetWare for LAT also supports third-party terminal emulators for DOS, Microsoft Windows, Apple Macintosh, OS/2, Unix, and Microsoft Windows NT workstations.

• List price: *NetWare for LAT: 16-user, $3,495; 32-user, $5,995; 64-user, $9,995; 128-user, $16,995. Novell Inc., 122 East 1700 South, Provo, UT 84606-6194; 800-453-1267, 801-429-7000.*

Circle 954 on reader service card

IMPROVED

Cisco To Upgrade Its Routers to SNMP-2

Network management is particularly important to router users. Little wonder, then, that router leader Cisco Systems was among the first companies to announce that all its routers will support SNMP-2, the latest version of the Simple Network Management Protocol, beginning in the second half of 1994. Cisco licensed the technology from SNMP Research and plans to combine SNMP-2 with its router management software, CiscoWorks, to provide additional security and more comprehensive error information.

SNMP-2 improves on its predecessor, offering enhanced security, enhanced protocol operations, and enhanced file management. Cisco will offer SNMP concurrently with SNMP-2 as long as users require it.

• *Cisco Systems Inc., P.O. Box 3075, 1525 O'Brien Drive, Menlo Park, CA 94026; 800-326-1941, 415-326-1941; fax, 415-326-1989.*

Circle 958 on reader service card

HOT PROSPECT

Newport Offers Low-Cost Solution for Dial-Up Access

Connecting to remote sites can be expensive, namely because of the need for dedicated phone lines. Newport Systems Solutions aims to reduce these telecommunication costs with the introduction of Call Connection Manager for its line of LAN^{2}LAN/MPR and LAN^{2}PC routers. Call Connection Manager provides on-demand and scheduled connectivity, as well as termination when the connection is no longer needed.

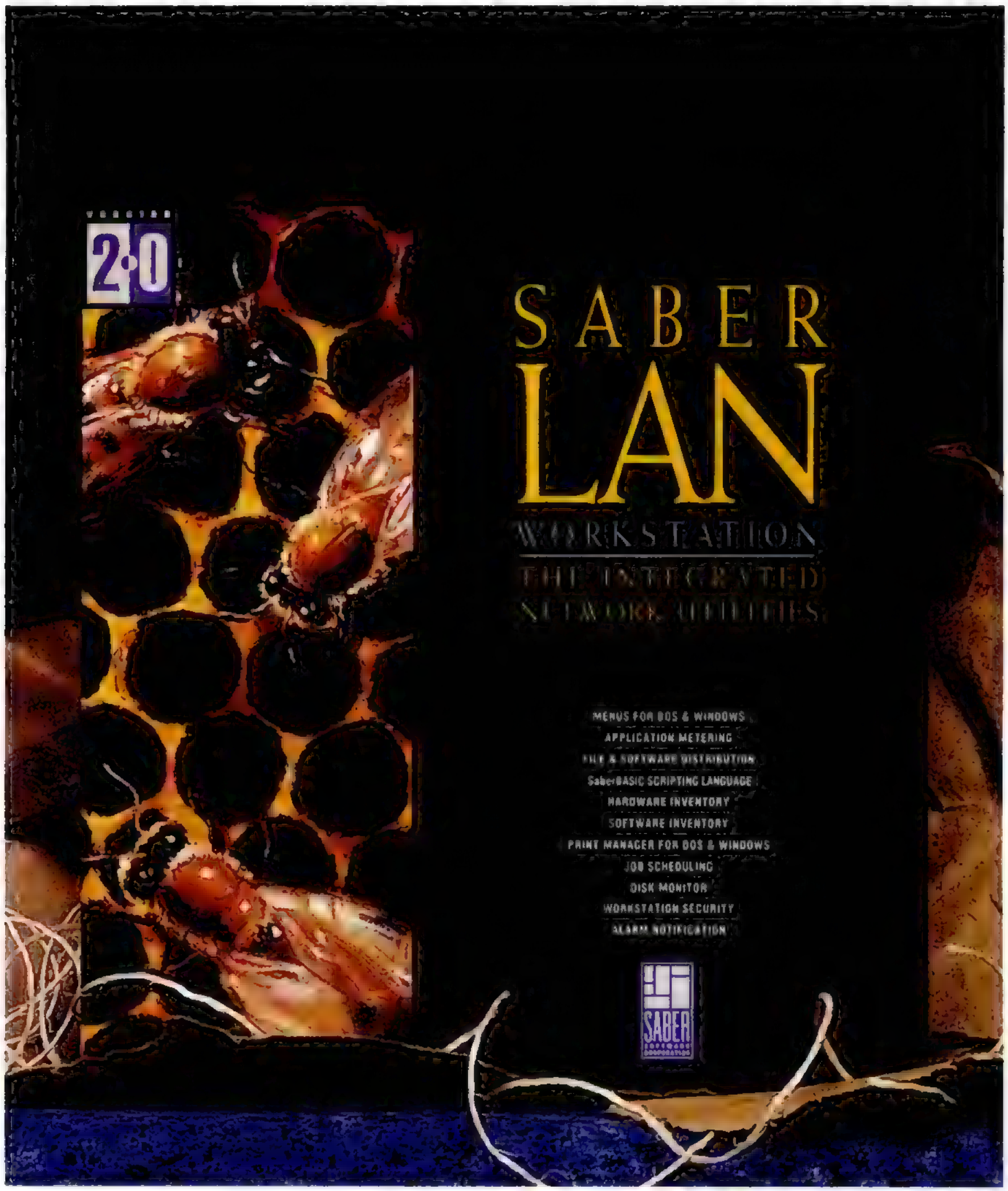
Call Connection Manager utilizes V.25bis to control calls for ISDN terminal adapters, channel service unit/data service units, and traditional modems. The software supports a variety of features to establish and disconnect calls, including dial backup, bandwidth on demand, activity calling, and call scheduling.

Call Connection Manager is available free to users of routers purchased after September 1, 1993.

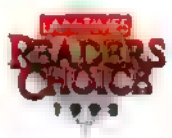
• List price: *Call Connection Manager upgrade, $995. Newport Systems Solutions Inc., 4019 Westerly Pl., #103, Newport Beach, CA 92660; 714-752-1511; fax, 714-752-8389.*

Circle 964 on reader service card

Uncover the industry's management solution. Saber



You'll find all this award-winning technology in Saber LAN Workstation 2.0:



ıost powerful network
AN Workstation version 2.0

A breakthrough like this can't be kept under wraps forever. Introducing Saber LAN Workstation version 2.0. A powerful new network management solution that improves on the functional richness, integration and value of our best-selling Saber LAN Workstation. Yet provides even more ways than ever for LAN administrators and LAN users to save time and make more efficient use of the network.

THE BEST WAY TO MOVE TOWARD CLIENT/SERVER. OR JUST FROM DOS TO WINDOWS.

Whatever stage you've reached in your network's development, Saber LAN Workstation can help. With its award-winning interface to the network, LAN Workstation is the best way to effect a smooth transition from DOS to Windows. And since it provides a stable platform on which to build your network, it can also help you implement client/server and mission-critical applications when you're ready.

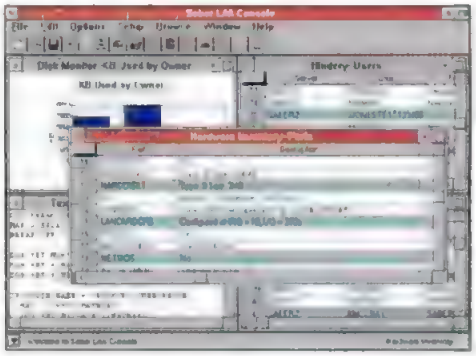
THE ONLY SINGLE-PRODUCT SOLUTION FOR:

- Menus for DOS & Windows™
- Application Metering
- File & Software Distribution
- SaberBASIC Scripting Language
- Hardware Inventory
- Software Inventory
- Print Manager for DOS and Windows
- Job Scheduling
- Disk Monitoring
- Workstation Security
- Alarm Notification

Compare any other integrated utilities to Saber LAN Workstation 2.0. You'll find our functional richness and our level of integration set the industry standards.

WE COULDN'T MAKE IT ANY MORE INTEGRATED. SO WE INTEGRATED MORE INTO IT.

The original Saber LAN Workstation was the first product to offer LAN administrators an integrated view of their network. And in version 2.0, we've included more tools, more reports and more ways for LAN administrators to keep track of vital network data.



Saber LAN Workstation 2.0 is the one product, the one interface you need for all essential network jobs.

Best of all, with Saber LAN Workstation, you won't have to sacrifice quality for integration. Each of its functional components could win a "best-of-breed" comparison as a standalone product. Put them together, and you have the one product, the one interface you need for essential network jobs. Saber LAN Workstation 2.0.

All of which helps explain why many of the most successful companies in America rely on Saber to maximize the performance and efficiency of their networks. 80 of the top 100 on the Fortune 500 list do so. You can, too. Just call **800-338-8754** and uncover the power of Saber LAN Workstation.

PER WORKSTATION LICENSE $39 CALL FOR UPGRADE DETAILS

SABER SOFTWARE CORPORATION

To order or for the reseller nearest you, call 1-800-338-8754

CIRCLE 858 ON READER SERVICE CARD

Saber LAN Workstation is compatible with Novell NetWare, Microsoft LAN Manager, Banyan Vines, DEC PathWORKS, IBM LAN Server, Artisoft LANtastic, MS-NET based-networks and Windows for Workgroups. Saber Software Corporation 5944 Luther Lane Suite 1007 Dallas, Texas 75225 800-338-8754 or 214-361-8086 Fax 214-361-1882

Copyright © 1993 Saber Software Corporation. Saber Software Corporation is not affiliated with American Airlines, Inc. or its SABRE Travel Information Network. All trademarks acknowledged.

NEW

Banyan Brings Intelligent Messaging to Unix

The number of Unix systems out there is growing, and Banyan Systems is reacting to that growth by bringing its Intelligent Messaging to Unix workstation and terminal users. Banyan's Intelligent Messaging is a mail and messaging application that features dynamic routing of messages as well as message compression.

The Intelligent Messaging interface for Unix allows users in a mixed MS-DOS and Unix environment to communicate through an integrated, enterprise-wide messaging system. The new interface is being offered as an option for VINES for SCO Unix. Banyan plans to offer it as an option for Hewlett-Packard's HP/UX, IBM AIX (Advanced Interactive eXecutive), and Sun Solaris.

• List price: *Intelligent Messaging interface for SCO Unix, $895. Banyan Systems Inc., 120 Flanders Rd., Westboro, MA 01581; 800-235-5332, 508-898-1000; fax, 508-898-1755.*

Circle 955 on reader service card

NEW

Cabletron Integrates Bridging, Routing, and Switching

As network managers look for more bandwidth, better security, and more powerful network management, they're turning to switching and internetworking devices. As a result, Cabletron Systems' new hub module, the ESX-MIM, integrates all of these features. The ESX-MIM provides bridging and routing for Cabletron's Multi Media Access Center (MMAC). It also features the company's high-performance switching technology, Secure Fast Packet Switching (SFPS), a technique that also creates a virtual network within a LAN, allowing a hub to prevent unauthorized access among nodes. The ESX-MIM provides six Ethernet ports and one ATM port. The module can be managed by any SNMP-compliant management software and will be available during the first quarter of 1994.

• List price: *Cabletron ESX-MIM, $8,995. Cabletron Systems Inc., 36 Industrial Way, Rochester, NH 03867-5005; 603-332-9400; fax, 603-337-2211.*

Circle 956 on reader service card

IMPROVED

Concord's Trakker: Newer, Faster, Better

WHO, WHAT, WHERE: Monitors individual nodes, segments, or the entire network.

The ability to create reports about virtually anything to do with network operation (and to do it in less time) is the bonus offered by enhanced version of Concord's Trak/Report, its network management application. Version 2.0 combines an Ingres relational database with reporting and graphing capabilities. Trak/Report, Version 2.0, part of the Trakker application family, features new capabilities including the ability to track communications between user-defined workgroups over time, which facilitates group capacity planning.

Despite the fact that the application monitors the entire enterprise network, Concord claims that it can produce in-depth reports for the large databases it uses in less than 10 minutes. While the previous version focused on Ethernet, Version 2.0 includes support for Token-Ring.

• List price: *Trak/Report, Version 2.0, $7,500. Concord Communications Inc., 753 Forest St., Marlboro, MA 01752-3044; 508-460-4646; fax, 508-481-9772.*

Circle 957 on reader service card

BRIEFS

BUSINESS NEWS

3Com and **AT&T Microelectronics** agreed to combine efforts to bring 100BaseT (formerly called 100BaseX) Fast Ethernet products to market. 3Com expects to roll out 100-Mbps products including adapters, hubs, and routers in the middle of the year. 3Com Corp., 408-764-5000; AT&T Microelectronics, 908-771-2000.

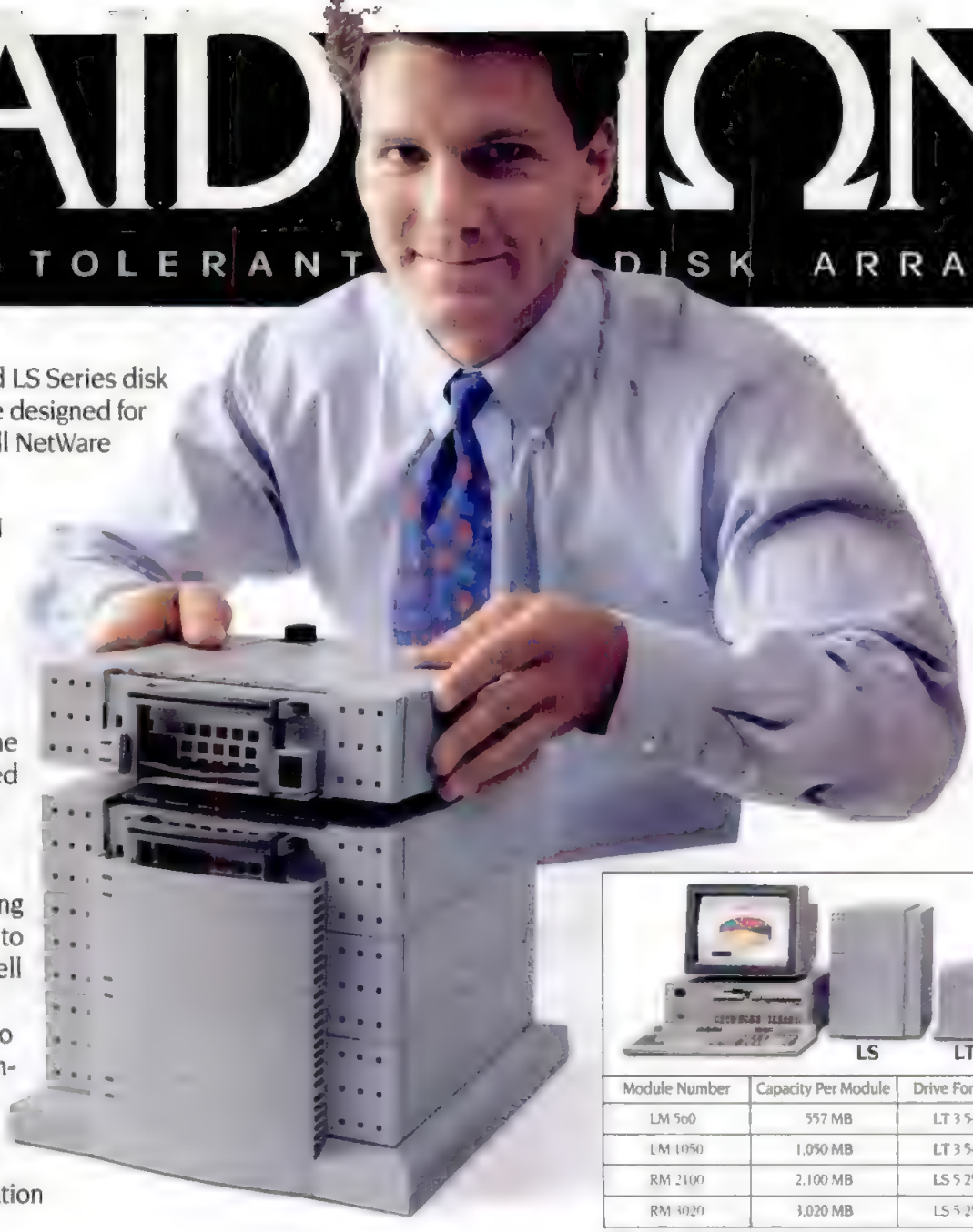
Cisco Systems and **LanOptics** joined forces to develop a remote-access technology that adds routing and hub functions to distributed LAN applications. The companies plan to introduce the first product, combining the technology from LanOptics' intelligent internetworking concentrators with the Cisco 3000 series of routers, in the first half of 1994. Cisco, 415-326-1941; LanOptics, 214-392-0647.

Chipcom and **Centrum Communications** announced a joint-development agreement regarding integrated remote-access capabilities. The agreement calls for the integration of Centrum's dial-up internetworking technology and Chipcom's family of intelligent switching hubs. The resulting products will allow remote users to become nodes on corporate networks. Chipcom, 508-460-8900; Centrum Communications, 408-894-1800.

Madge Networks and **Novell** introduced their strategy for a new Token-Ring solution for branch office internetworking. The Branch Office Strategy will deliver integrated product solutions such as using Madge's Smart 16/4 Bridgenode adapter in conjunction with Novell's NetWare MultiProtocol Router 2.1 for bridging and routing functionality. Madge Networks, 800-876-2343; Novell, 800-453-1267.

RAIDION

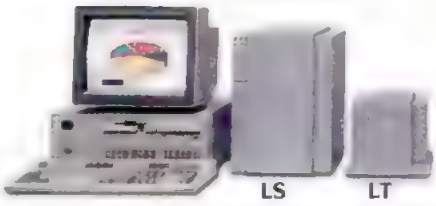
FAULT-TOLERANT DISK ARRAYS



RAIDION LT and LS Series disk array subsystems are designed for use with either Novell NetWare 3.11/4.0 or IBM OS/2.

MIRROR. RAIDION can be configured with 2 modules to provide mirrored fault tolerance up to 3GB.

RAID 5. Adding one module to a mirrored array and installing RAIDWARE™ doubles the user capacity by converting the mirrored array to RAID 5. Under Novell NetWare, RAIDION can be expanded to 32 modules per single array with a capacity of 93GB. Under OS/2, the maximum configuration is 28 modules.



Module Number	Capacity Per Module	Drive Form Factor
LM 560	557 MB	LT 3.5-inch
LM 1050	1,050 MB	LT 3.5-inch
RM 2100	2,100 MB	LS 5.25-inch
RM 3020	3,020 MB	LS 5.25-inch

Other add-on Module capacities available

RELIABLE. RAIDION can be configured with an on-line spare option that activates automatically upon a drive failure, ensuring continued fault-tolerant operation without human intervention. Hot-Swap and Hot Replacement features allow RAIDION to be serviced while your network remains in operation.

ECONOMICAL. An LT Series three module 2 GB array is just $7,545. An LS Series Raid 5 array with a capacity of 6 GB lists for just $16,980. That's less than $3.00 per MB. It's no wonder Byte Magazine said: "RAIDION's *low price alone makes it worth considering.*" August, 1992.

AWARD WINNING. In a benchmark comparison of disk arrays, Corporate Computing said: *"Raidion was our overall winner with an impressive combination of high performance, low cost, and unparalleled expandability."* May, 1993

For the name of your authorized RAIDION *distributor and a free brochure call* 1-800-395-3748.

CIRCLE 914 ON READER SERVICE CARD

yes NetWare Tested and Approved

MICROPOLIS®

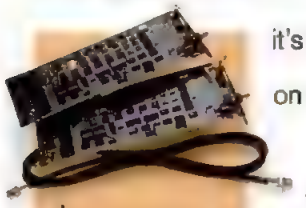
All logos and names are the property of their respective owners.

How long are you willing to wait for high speed networking?

TCNS™ From Thomas-Conrad.

The Proven Route To 100Mbps Networking.

Let's face it, your network isn't getting any younger. And it's not getting any faster, either — at least not in the near future. Unless of course you use TCNS. It's right here, right now, and available at the right price. No wonder it's the leading 100Mbps solution on the market.



$595†

Call now for your TCNS Starter Kit. Only $595, while supplies last.

Thousands of users rely on TCNS for their most demanding network applications. It gives you all the speed your network needs to run Windows,™ distributed databases, even the most demanding client/server applications. Plus power to spare for future applications like imaging, video, and multimedia. It's even the preferred MSL solution for NetWare® SFT III.

Best of all, it's fast and easy to get started. TCNS runs on your existing coax, shielded twisted-pair or fiber-optic cable. And TCNS comes complete with a full complement of drivers for all major network operating systems. All for less than $600 per node.*

yes NetWare Tested and Approved

So if you're dying to try out 100Mbps speeds right now, call Thomas-Conrad at **1-800-332-8683** and ask how TCNS can blow the cobwebs out of your network.

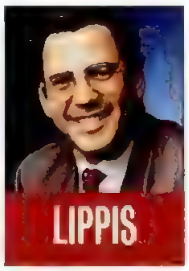
CIRCLE 857 ON READER SERVICE CARD

THOMAS-CONRAD®
CORPORATION

1908-R Kramer [illegible] Austin, TX 78758 (512) 836-1935 (800) 654-3822 in Canada [illegible] The "Yes" and NetWare logos are trademarks of Novell, Inc. All brand or product names are trademarks or registered trademarks of their respective holders. †Includes two 16-bit coax adapters and cable. Limit one per customer, end users only. Offer available in USA only, for a limited time. *Based on estimated selling price of a 16-bit ISA adapter

The Router Meets Jurassic Park

Dinosaurs, we are told, may have been wiped out by a meteorite, but that type of event's not likely to repeat itself in the near future—at least, that's what the statisticians tell us. Clearly, the statisticians aren't network managers. If they were, they would know that the high-flying router market is about to encounter the ATM meteorite, yielding a similar outcome.



How could the minuscule ATM market pose such a threat to the mighty router market?

How could the minuscule ATM market pose such a threat to the mighty router market? The answer is simple: Even a single ATM interface on a standalone router can generate more traffic than its packet-processing engine can handle. But since ATM LANs are in their infancy, the threat is off in the horizon. The backbone router market will not go away with a burst, but will be chiseled away over the next five to six years. Individual features will be parceled out among ATM switches and hubs, leaving the router a relic of the bygone era of networking.

If you listen closely, you can hear the chisel at work: Cisco Systems and Alcatel agreeing to place Cisco's routing software on Alcatel's 1100 HSS ATM switch, Cisco tweaking its microcode to increase the performance of its 7000 router to some 200,000 packets per second (pps) up from 115,000 pps, SynOptics buying Coral Networks for routing software, 3Com and Fore Systems teaming up to combine routing and ATM switching, CrossComm and General Data Comm jointly building an ATM switch with routing, and IBM with its ATM chip set and 6611 routing software jointly developing an ATM hub that routes with Chipcom's hub while Wellfleet and Cabletron each deciding to go it alone.

The genesis of much of this cooperation can be found in the math. A single ATM interface running at 155 Mbps will generate a huge amount of traffic, inundating the router with from 26,000 to 605,000 pps. Even the top-performing routers, such as Wellfleet's Backbone Concentrator Node, which claims 480,000-pps throughput, will find it hard to keep up with such demands.

Routing as we know it is being rethought and its functions are being distributed across multiple networking devices—primarily hubs, thanks to their growing number and increasing processing power. (See "A Hub Above" in this issue.) Routing functions that are being distributed are media connect, bandwidth management, and networking intelligence. Media connect provides the interconnection of LANs and ATM networks, the conversion between LAN frames and ATM cells, and the forwarding of those cells. The placement for media connect is ideally suited as a module within a hub since it is located where LANs are connected to a corporate network. In this scenario, bandwidth management controls both the cell switching and path selection that are necessary for moving ATM cells between two or more nodes.

Networking intelligence includes functions such as enforcing routing policies such as filtering, broadcast control and priorities, the identification of paths through the network, the resolution of addressing such as the mapping of an IP network address to an ATM Virtual Path Identifier/Virtual Circuit Identifier, access control, and user security checks. The networking intelligence is either distributed across a network or centralized.

So what does all of this mean to the typical network manager? Well, for one thing, this approach will eliminate the standalone router bottlenecks, especially in collapsed backbones where the router provides hub-to-hub, hub-to-server, and also LAN-to-WAN routing functions from a single device.

The distributed routing approach outlined above does not have to be implemented in an all-or-nothing fashion. Next year some vendors such as 3Com will be offering bundled media access and bandwidth management within existing hubs via modules. And with some 30 million computers plugged into LANs and 10 million more coming next year, if congestion isn't an issue today, it will be in the near future.

The downside to the distributed routing approach is interoperability with existing standalone routing. It is unclear how existing routing algorithms (the protocols that routers use to share information), such as open shortest path first (OSPF), the Routing Information Protocol (RIP), and Cisco's IGRP, from different vendors will cooperate within a distributed routing architecture. One thing seems to be sure, however: Router vendors will increasingly compete to have their software licensed rather than competing to sell their standalone solutions so that both interoperability and lock-in of client accounts are assured.

In the end, though, as the meteorite killed off the dinosaurs but left a large population of smaller reptiles and other life forms, larger routers will be unable to keep up with the changes occurring within the backbone while their smaller cousins will continue to thrive in the remote-office marketplace.

NICK LIPPIS is a contributing editor of *PC Magazine* and is president of Strategic Networks Consulting, a consultancy specializing in enterprise networking. He is also publisher of *The Internetwork Advisor*, a monthly newsletter.

Becky Weinberg,
Technical Writer,
Microcom

GREAT IDEA!

MICROCOM'S CARBON COPY FOR WINDOWS. THE EASIEST WAY TO BE AT YOUR OFFICE PC WHEN YOU CAN'T BE AT THE OFFICE.

"...the closest thing to having remote control built into Windows itself."
—Windows Magazine

Over a million people rely on Microcom's Carbon Copy for fast, effortless remote access. No other program makes it so simple to be on your office PC or LAN anytime you're away from the office.

Traveling professionals use Carbon Copy to send and retrieve files, and check e-mail. Branch office personnel and telecommuters use it to access vital data on corporate LANs. While support specialists use it to assist both LAN-based and remote users, saving time on both ends.

Our newest version makes remote computing in Windows a breeze, with faster screen updates than any other program, when running applications. Also, data compression speeds up file transfer—for big savings in time and phone charges.

The graphical user interface includes familiar point-and-click and drag-and-drop functions, for the ease of use you expect in Windows. You can run Carbon Copy right out of the box. And it supports DOS as well as Windows users.

Microcom's Carbon Copy for Windows: the first remote control software that doesn't make you feel remote. What a great idea.

Now for just $49, upgrade to Carbon Copy for Windows version 2.0

Upgrade from any remote control software, including any version of Carbon Copy. To order, phone 1-800-765-1750.

30-Day No-Risk Guarantee

Try Carbon Copy for Windows version 2.0 for 30 days at absolutely no risk. If you're not fully satisfied, return it for a refund.

For free information on Carbon Copy and the name of your local Microcom dealer, phone **1-800-822-8224**

Microcom offers a complete suite of remote access products.

Only Microcom provides such a wide range of remote access products and capabilities. They include a full line of high-speed desktop and portable modems; Microcom Bridge/Routers™ (MBR™) for remote internetworking; and High Density Management Systems™ (HDMS™) for dial-up networks. Call for details.

microcom

The brightest ideas in remote access.

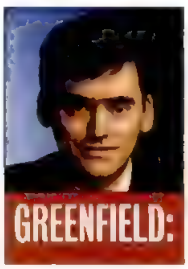
Microcom, Inc. 500 River Ridge Drive, Norwood, MA 02062-5028
Phone 617-551-1000 • Fax 617-551-1021 • International Fax 617-551-1007

Microcom is a registered trademark; and Carbon Copy, High Density Management System, HDMS, Microcom Bridge/Router and MBR are trademarks of Microcom Systems, Inc. All other trademarks are the property of their respective trademark holders.

CIRCLE 862 ON READER SERVICE CARD

Searching for the Right Modem Standard

Walking among the crowds at Comdex, Frank, I was astounded to see how many vendors had announced support for V.32 terbo. It seemed that a dozen or so were offering modems that support the high-speed modem specification originally promoted by AT&T. Yet V.32 terbo was rejected by the ITU (International Trade Union, formerly the CCITT)—though it will probably be reproposed as a revision of V.32bis—in favor of a competing proposal, V.fast Class, which will change gradually into V.34, the new standard for 28.8-kilobit-per-second modems.



Both V.32 terbo and V.fast Class are specifications for improving modem performance, but that's where the similarity ends. V.32 terbo is based on V.32bis and boosts line performance from 14.4 Kbps to 19.2 Kbps, while V.fast Class requires new hardware to boost throughput up to 28.8 Kbps and improve the reliability of the line.

Users bent on performance will buy V.fast Class modems. But for most, V.32 terbo will be the standard of choice.

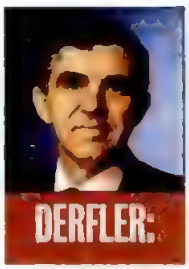
The dramatic boost in performance in V.fast Class is achieved by increasing the number of bits that a modem encodes onto a carrier signal. With more bits encoded onto the signal, the modem requires a more sensitive—and more expensive—transmitter and receiver. In contrast, V.32 terbo increases the transmission rate.

V.fast Class modems will also do line probing to test the line and determine the optimum speed for transmitting data.

However, because of these two features, V.fast Class modems will cost $100 or so more than V.32 terbo modems. Once the V.34 standard is approved, either users will have to buy a V.34-compliant modem or they will have to get a ROM upgrade for their V.fast Class modems. Users bent on getting the fastest modem around will look at V.fast Class.

Everybody wants or needs all that speed. But not today. And the jump to V.fast Class speed just won't be enough for most users, given the amount of money they will have to pay. The only reason V.32bis (14.4-Kbps) modems sold so much better than V.32 (9.6-Kbps) modems was that the price difference was minimal. (Why buy 9.6 Kbps when for the same price you could get 14.4 Kbps?) But here, we're talking at least $100 or so to get the V.fast Class functionality. I think for many users that cost will be prohibitive. Users bent on performance will buy V.fast Class modems. But for most, V.32 terbo will be the modem standard of choice.

David, exasperation and frustration are poor parents to an idea because their offspring are likely to bring more of the same. That's certainly true in modem development. Reasonable people acting reasonably should have released a V.34 modem standard a year ago. But since neither reasonable condition existed in the ITU committee, AT&T and Phylon led a frustrated group of vendors in a direction called V.32 terbo while Rockwell and Hayes led a similarly exasperated group to barricades called V.fast Class. I say a pox on both their houses. Don't buy either one.



Today's aggressive buyers are likely to lose with both the modems and the PCs they use to communicate. We should have a V.34 standard by the third quarter of 1994, and modems designed to meet the standard will appear before the ITU's documentation is published. Some vendors promise to upgrade your V.fast Class modem to V.34, but what a hassle! In the buyer's lane, slow and steady wins this race. Wait for the real V.34, and in the interim get your PCs ready to work with them.

I say a pox on both their houses. Don't buy either one. Aggressive buyers are likely to lose.

The bigger story, overshadowed by the skirmishing, is that modems from both camps will exasperate and frustrate 80 percent of their buyers. Data from PC Magazine Labs shows that less than 20 percent of the new PCs coming in for evaluation have the necessary serial-port hardware to receive data reliably at the rates the V.32 terbo and V.fast Class modems can deliver. Most serial ports will lose data at rates higher than 12 or 14 Kbps, causing retries and even cancellations of file transfers. Unless you properly equip your PCs, you'll never get the benefit of faster modems.

The easiest way to handle the serial-port problem is to buy an internal modem, which has its own serial-port hardware. But the sales figures show that people prefer external modems. DigiBoard, Hayes, Multi-Tech, and Telcor Systems each offer processor-equipped serial-port adapters that can buffer data from the modem. Not one of their products is perfect, but you've got to use one of them if you expect to handle the firehose stream of data from a V.34 modem.

Don't let the vendors' exasperation and frustration spill over on you. Wait for the real V.34 modems, and prepare your PCs for the faster data they will bring.

PRINT SERVERS

Ethernet ◆ Token Ring ◆ Arcnet
Pocket size ◆ HP plug-in cards
Netware ◆ TCP/IP

We've packed each model with features, performance, and value. You can't get a better print server for the price.

- Connects your printer directly to your Novell Netware and TCP/IP networks
- Microserv models plug directly into parallel port on any printer
- Lanjet models plug into HP XIO and MIO option slots
- Up to 100,00 characters per second on parallel port
- Serial port can be input to printer or output from network at up to 115.2K baud
- Prints status and configuration at the push of a switch
- Comes with a one-year warranty and unlimited technical support, made in USA

NETWARE FEATURES

- Auto detects 8 queues on up to 8 file servers
- Can notify user of job completion and printer errors
- Supports encrypted passwords
- Shows status via Netware's PSC and PCONSOLE
- Installation program simplifies setup
- Auto detects and uses 802.3 and Ethernet II
- Auto detects and attaches to new file servers
- Simultaneous queue server and PSERVER modes

yes
It runs with NetWare

TCP/IP FEATURES

- Finds IP address from BOOTP, RARP, or memory
- Supports LPR, RSh, Rexec, and standard TCP/IP connections to any TCP/IP host
- Configure using Telnet, TFTP, or the serial port
- Supports secure hosts with list of allowable IP addresses and subnet masks
- Notifies user or supervisor of job completion and printer statistics via SMTP mail and SYSLOG entries
- Shows estimated job completion time and throughput via LPQ command
- Customized banners in PCL or Postscript
- User-defined strings before and after job
- Flash EPROM for easy upgrade to new versions
- Can convert UNIX ascii files to print directly to postscript and non-postscript printers

CALL NOW FOR FREE CATALOG

- Print servers
- Data switches
- Keyboard monitor products

Make the Rose Connection

ROSE ELECTRONICS

10850 Wilcrest Drive ◆ Houston, Texas 77099 ◆ Phone (713)933-7673 ◆ Fax (713)933-0044

800-333-9343

CIRCLE 865 ON READER SERVICE CARD

Network Edition Advertisers Index

Reader Service No.	Advertiser	Page
874	3 Com Corporation	NE20-NE21
910	3M Data Storage Products	69
915	American Power Conversion	NE19
934	Cameo Communications Inc	271
908	Corel Corporation	NE24
932	Datapoint Corporation	NE22
901	DCA	260
854	DIGIBOARD	NE12
930	Digital Equipment Corporation	NE2-NE3
931	Digital Equipment Corporation	NE16-NE17
925	Fluke Corporation	NE11
933	Hayes Microcomputer Products	139
942	Hewlett Packard	NE7
*	IBM Networking Systems	256-257
882	Intel Corporation	NE5
855	Micro Solutions Computer Products	159
862	Microcom	NE32
914	Micropolis Corporation	NE29
*	Microsoft	NE8-NE9
879	MiLAN Technology Corporation	NE15
878	Network Express	365
865	Rose Electronics	NE34
856	Saber Software	NE26-NE27
857	Thomas Conrad Corporation	NE30
920	US Robotics Inc	246

* No Reader Service #. Please Call Advertiser For Information.

FOR QUICKER RESPONSE
FAX TO
(609) 625-0932

FREE NETWORK PRODUCT INFORMATION

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 433 RIVERTON, NJ

POSTAGE WILL BE PAID BY ADDRESSEE

PC MAGAZINE NETWORK EDITION

P.O. Box 1687
RIVERTON, NJ 08077-9687

Welcome. . . to the Network Section!

Circle the numbers below corresponding to products featured in the Network Section only. Use reader service card in the back of book to obtain information on other products. Fill in your name and address and answer the questions below. Manufacturers will mail FREE product literature to you.

Void after May 31, 1994

FREE NETWORK PRODUCT INFORMATION REPLY CARD

851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	
876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	
901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	
926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	
951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	
976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999		

1. Do you work in a DP/MIS dept.?
01 ☐ Yes 02 ☐ No

2. Please indicate your company or organization's primary business activity: (Check one)
01. ☐ Manufacturer Computer Equip., Computers, Software
02. ☐ Manufacturer–Aerospace
03. ☐ Manufacturer–Other
04 ☐ Systems House
05. ☐ Computer Consultant
06. ☐ Computer Retailer/VAR/VAD Distributor
07. ☐ Communications
08. ☐ Finance/Banking/Insurance/ Real Estate/Accounting
09. ☐ Education
10. ☐ Government
12. ☐ Research and Development
13. ☐ Data Processing/Computer Service
14. ☐ Health/Medical/Legal Service
15. ☐ Engineering/Architecture
16. ☐ Agr./Const./Mining/Oil/ Transp./Utilities
17. ☐ Non-Computer Retailer/Dist.
18. ☐ Other Business or Service

3. Please indicate your primary business function: (Check one)
01. ☐ DP/MIS
02. ☐ Systems, Programming
03. ☐ Communications
04 ☐ Engineering
05. ☐ Res./Dev./Scientific
06. ☐ Accounting/Finance
07. ☐ Computer Consulting
08. ☐ Purchasing
09. ☐ Operations
10. ☐ Production
11 ☐ Education/Training
12. ☐ Marketing/Sales
13. ☐ Medical/Legal
14. ☐ Admin./Mgmt.

4. Is your company a reseller?
01. ☐ Yes 02. ☐ No

5. For how many nodes do you specify brands of networking products?
01 ☐ 10 or less 03 ☐ 26-99
02. ☐ 11-25 04 ☐ 100 or more

6. Do you plan to buy any network products:
01. ☐ Now 03 ☐ in 7–12 mos.
02. ☐ In 4–6 mos. 04. ☐ no plans

7. Please indicate the connections currently installed or planned for installation within the next 12 months at your current business location:

Installed	Planned
01 ☐ LAN to LAN	04 ☐ LAN to LAN
02. ☐ LAN to Host	05. ☐ LAN to Host
03 ☐ LAN to WAN	06 ☐ LAN to WAN

8. Number of employees in your entire company and at the site where you work:

Entire Company	At This Location
01 ☐ 25 or less	01 ☐ 25 or less
02. ☐ 26–99	02. ☐ 26–99
03. ☐ 100–499	03. ☐ 100–499
04 ☐ 500–999	04 ☐ 500–999
05. ☐ 1000 or more	05 ☐ 1000 or more

PC 1/25 -1

Name

Title | Telephone

Company Name

Address

City | State | Zip

☐ Please send me a one-year (22-issue) subscription to PC Magazine for $29.97 (U.S. price); all other countries add $36.00 for additional postage.

Welcome...to the Network Section!

Circle the numbers below corresponding to products featured in the Network Section only. Use reader service card in the back of book to obtain information on other products. Fill in your name and address and answer the questions below. Manufacturers will mail FREE product literature to you.

Void after May 31, 1994

In a Hurry? Fax This Card To 609-829-0592

FREE NETWORK PRODUCT INFORMATION REPLY CARD

851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875
876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900
901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925
926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950
951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975
976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	

1. Do you work in a DP/MIS dept.?
01. ☐ Yes 02. ☐ No

2. Please indicate your company or organization's primary business activity: (Check one)
01. ☐ Manufacturer Computer Equip., Computers, Software
02. ☐ Manufacturer–Aerospace
03. ☐ Manufacturer–Other
04. ☐ Systems House
05. ☐ Computer Consultant
06. ☐ Computer Retailer/VAR/VAD Distributor
07. ☐ Communications
08. ☐ Finance/Banking/Insurance/Real Estate/Accounting
09. ☐ Education
10. ☐ Government
12. ☐ Research and Development
13. ☐ Data Processing/Computer Service
14. ☐ Health/Medical/Legal Service
15. ☐ Engineering/Architecture
16. ☐ Agr./Const./Mining/Oil/Transp./Utilities
17. ☐ Non-Computer Retailer/Dist.
18. ☐ Other Business or Service

3. Please indicate your primary business function: (Check one)
01. ☐ DP/MIS
02. ☐ Systems, Programming
03. ☐ Communications
04. ☐ Engineering
05. ☐ Res./Dev./Scientific
06. ☐ Accounting/Finance
07. ☐ Computer Consulting
08. ☐ Purchasing
09. ☐ Operations
10. ☐ Production
11. ☐ Education/Training
12. ☐ Marketing/Sales
13. ☐ Medical/Legal
14. ☐ Admin./Mgmt.

4. Is your company a reseller?
01. ☐ Yes 02. ☐ No

5. For how many nodes do you specify brands of networking products?
01. ☐ 10 or less 03. ☐ 26–99
02. ☐ 11-25 04. ☐ 100 or more

6. Do you plan to buy any network products:
01 ☐ Now 03. ☐ in 7–12 mos.
02. ☐ in 4–6 mos. 04 ☐ no plans

7. Please indicate the connections currently installed or planned for installation within the next 12 months at your current business location:

Installed	Planned
01 ☐ LAN to LAN	04 ☐ LAN to LAN
02 ☐ LAN to Host	05 ☐ LAN to Host
03. ☐ LAN to WAN	06 ☐ LAN to WAN

8. Number of employees in your entire company and at the site where you work:

Entire Company	At This Location
01 ☐ 25 or less	01 ☐ 25 or less
02 ☐ 26–99	02 ☐ 26–99
03. ☐ 100–499	03. ☐ 100–499
04 ☐ 500–999	04. ☐ 500–999
05. ☐ 1000 or more	05. ☐ 1000 or more

PC 1/25 -1

Name

Title | Telephone

Company Name

Address

City | State | Zip

☐ Please send me a one-year (22-issue) subscription to PC Magazine for $29.97 (U.S. price); all other countries add $36.00 for additional postage.

FOR QUICKER RESPONSE FAX TO (609) 829-0592

FREE NETWORK PRODUCT INFORMATION

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 433 RIVERTON, NJ

POSTAGE WILL BE PAID BY ADDRESSEE

PC MAGAZINE NETWORK EDITION

P.O. Box 1687
RIVERTON, NJ 08077-9687

PCTech

Spy on the interrupt calls your programs are making with this issue's utility, INFORMER, by Bob Flanders and Michael Holmes. Also, Kaare Christian explains C++ templates in this issue's Power Programming column.

User-to-User

BY NEIL J. RUBENKING

Load COMMAND .COM High

DOS 5.0 doesn't provide a way to load COMMAND.COM and its environment into upper memory blocks, but I've found a simple way to do this. Create UMB.COM by redirecting the script file in Figure 1 into DEBUG with the command `DEBUG < UMB.SCR`. Then add the following line to your CONFIG.SYS file:

```
INSTALL=d:\path\UMB.COM E
```

where *d:\path* represents the appropriate drive and directory. You can also download UMB.COM and its DEBUG script from PC MagNet archived as UMB.ZIP.

Besides causing COMMAND.COM to be loaded into upper memory, this will also cause every TSR in AUTOEXEC.BAT to be loaded into upper memory as well, without requiring the LOADHIGH command. In fact, DOS 5.0 does not provide an INSTALLHIGH command for CONFIG.SYS, but UMB.COM will cause all INSTALLed TSRs listed after it in the CONFIG.SYS file to be loaded high.

Somewhere before the end of AUTOEXEC.BAT, you *must* insert the command UMB with no parameters. This restores the default memory-allocation strategy for DOS. You should definitely restore normal operation before any lines that run non-TSR programs. Also, not all programs can be loaded in upper memory; some may not function correctly or may even crash the system.

There is one minor drawback to this program. DOS 5.0 expects programs executed with the INSTALL command in CONFIG.SYS to be TSRs, and it assumes that an error occurred if the program doesn't leave anything resident in memory. Since UMB.COM is not a TSR, DOS displays the message, "Error in CONFIG.SYS line *xx*." If you can live with this, you won't have a problem.

UMB.COM takes advantage of DOS 5.0's new memory-allocation strategy functions. Normally DOS doesn't consider UMBs when a program requests memory. But if the first nonspace character on UMB.COM's command line is either e or E, the program will use these new functions to link the UMBs into the chain of available memory blocks and then tell DOS to look first in the UMBs when a request for memory comes in. Then when DOS allocates memory for COMMAND.COM and its environment, DOS will first attempt to allocate from upper memory. Using any other charac-

UMB.SCR

Complete Listing

```
N UMB.COM
A 100
MOV SI,81          ; point to the beginning of the parameter string
LODSB              ; get the first character
CMP AL,20          ; is it a space?
JE 103             ; yes, then get the next character
CMP AL,65          ; is it 'e'?
JE 11E             ; yes, then go to the enable UMB code
CMP AL,45          ; is it 'E'?
JE 11E             ; yes, then go to the enable UMB code
MOV AX,5803        ; Select Set Link State function
MOV BX,0           ; Unlink UMBs (default)
INT 21             ; DOS function call
JC 12F             ; if there was an error, abort
MOV AL,1           ; set memory allocation strategy to first fit
                   ; (BX is still set to 0)
JMP 12D            ; jump to last DOS function call
MOV AX,5803        ; select Set Link State function
MOV BX,1           ; Link UMBs
INT 21             ; DOS function call
JC 12F             ; if there was an error, abort.
MOV AL,1           ; Set memory allocation strategy
MOV BX,80          ; Use UMBs first
INT 21             ; DOS function call
MOV AX,4C00        ; select terminate program function
INT 21             ; DOS function call

R CX
34
W
Q
```

Figure 1: This DEBUG script produces the UMB.COM utility.

IN THIS SECTION

Tutor 281
Corporate Developer 285
Toolkits 289
Environments 291
Power Programming 297
Utilities 302
Solutions 309

ter on UMB's command line causes the program to restore the memory allocation strategy to the default of ignoring upper memory.

Roger Brouwer
Los Angeles, California

▶PC MAGAZINE: UMB.COM should be considered an experimental program because there's no way to guarantee it will work on all systems. Before using it, make sure you have a bootable floppy disk handy, on the chance that UMB.COM might prevent your computer from booting properly. There's no reason UMB.COM should cause trouble, but it's better to be safe than sorry! Of course, your system configuration must provide upper memory blocks or UMB.COM can't do a thing.

Before you install UMB.COM, run the MEM command to check your largest executable program size. If you're running DOS 6.*x*, enter `MEM /M COMMAND` and note the addresses shown for COMMAND.COM and its environment. Now install UMB.COM with the E parameter as the *last* line in your CONFIG.SYS, and restore normal operation with a call to UMB.COM as the *first* line in your AUTOEXEC.BAT. Reboot and run MEM again—you should see about a 3K increase in the largest executable program size. Under DOS 6.*x*, `MEM /M COMMAND` should now display addresses above 0A000—upper memory addresses.

If this minimal use of UMB.COM works without a hitch, you can try moving any TSRs installed in your CONFIG.SYS to *after* the line that installs UMB.COM. In AUTOEXEC.BAT, don't put anything ahead of the line that calls UMB.COM to restore normal memory allocation. LOADHIGH works just fine for TSRs in AUTOEXEC.BAT, so there's no reason to use this utility for them.

Multiple CHKDSKs

I recently added a new hard drive, divided into two partitions. I found that if I ran CHKDSK on all three partitions, the report for the first scrolled off the screen. So I wrote a simple batch file that runs CHKDSK on drives C:, D:, and E: in turn, concatenates the results into a file, and then prints the file. This gives a printout of the CHKDSK results for all drives on one page, which is very handy.

Helen Bell Feddema
Kerhonkson, New York

CK.BAT
Complete Listing

```
@ECHO OFF
REM CK.BAT - Runs CHKDSK on drive C:, D:, and E:
REM   and prints the result.
IF NOT '%1'=='' GOTO OneDrive
FOR %%v IN (C: D: E:) DO CALL %0 %%v
ECHO ^L > PRN
REM The ^L symbol in the line above is Ctrl-L
GOTO End

:OneDrive
ECHO Drive %1 CHKDSK > PRN
ECHO --------------- > PRN
CHKDSK %1 > PRN
:End
```

Figure 2: **CK.BAT runs CHKDSK on drives C:, D:, and E: and prints the results.**

CKOK.BAT
Complete Listing

```
@ECHO OFF
REM CKOK.BAT - runs CHKDSK on multiple drives
REM            and reports any BAD news
IF NOT '%1'=='' GOTO OneDrive
IF EXIST CHKERROR.LOG DEL CHKERROR.LOG
FOR %%v IN (C: D: E:) DO CALL %0 %%v
DEL CHKTEMP.$$$
IF NOT EXIST CHKERROR.LOG ECHO All's well!
IF NOT EXIST CHKERROR.LOG GOTO End
MORE < CHKERROR.LOG
GOTO End

:===== OneDrive =====
ECHO Checking drive %1...
CHKDSK %1 > CHKTEMP.$$$
FIND < CHKTEMP.$$$ /I "Errors" > NUL
IF ERRORLEVEL 1 GOTO End
ECHO === CHKDSK report for drive %1=== >> CHKERROR.LOG
TYPE CHKTEMP.$$$ >> CHKERROR.LOG
ECHO Drive %1 has errors - see CHKERROR.LOG!
:===== End ==========
```

Figure 3: **CKOK.BAT runs CHKDSK on drives C:, D:, and E: and logs the results *only* if there's a problem.**

▶PC MAGAZINE: Ms. Feddema's original CK.BAT relied on a number of ancillary and temporary files. I rewrote it to eliminate those files. When you first run the batch file in Figure 2, it has no command line parameters, so the initial IF test does *not* jump to the label OneDrive. The FOR line reexecutes the batch file once for each of the three drive letters C:, D:, and E:. (If you have more or fewer drives, adjust the list accordingly.)

When CK.BAT reexecutes itself, it passes a drive letter as the first command line parameter, so the initial IF test jumps to the label OneDrive. The batch lines at that label send a drive-letter header to the printer followed by the output of CHKDSK itself.

After all three drives have been processed, the line after the FOR command sends a ^L (Ctrl-L) form-feed character to the printer.

I usually don't care about the output of CHKDSK—unless there's a problem. CKOK.BAT (Figure 3) logs the output of CHKDSK for drives C:, D:, and E: *only* if an error occurs. After processing all three drives, the batch file checks for the existence of CHKERROR.LOG. If it's not present, all drives tested okay. If the file *is* present, CKOK.BAT displays it using the MORE command.

You can download both batch files from PC MagNet archived as CK.ZIP. □

PANELBOOK.™ IT FITS NICELY IN TIGHT BUDGETS, TOO.

Portable LCD projection panels. Starting at just $3299.

You're probably as tight on money as you are on space.

That's why we developed the new PanelBook™ 450. Uniquely crafted to project presentations side-by-side from notebook computers, PanelBooks are up to 40 percent smaller than most panels.

And the PanelBook 450 has a price to match. That's because it utilizes In Focus Systems' innovative new TSTN^2 technology, giving its 16.7 million colors outstanding saturation and contrast. Plus a response time fast enough for QuickTime™ and Video for Windows.™

As the market leader in LCD projection, we offer the broadest choice of LCD projection solutions available. So call us today. We've got a PanelBook to fit any budget. Not to mention any briefcase.

CALL 1-800-294-6400 FOR A FREE GUIDE TO GIVING EFFECTIVE PRESENTATIONS.

InFocus®
S Y S T E M S

NP4502 ©1993 In Focus Systems, Inc. 7770 SW Mohawk Street, Tualatin, Oregon 97062. Phone (503) 692-4968. Fax (503) 692-4476. In Europe: Planetenweg 91, NL-2132 HL, Hoofddorp, The Netherlands. Phone 31 (0) 2503 23200. Fax 31 (0) 2503 24388. In Focus Systems and TSTN are registered trademarks, and PanelBook is a trademark of In Focus Systems, Inc. All other products are trademarks of their holders.

CIRCLE 390 ON READER SERVICE CARD

It's The Best Ride You'll Ever Take.

Leading the way in display technologies, CTX provides you with the total monitor solutions.

Climb aboard.

MODEL	5468A	1451	1461	1561	1560	1760LR
CRT/Dot Pitch	14"/0.28 mm	14"/0.28 mm	14"/0.28 mm	15"/0.28 mm	15"/0.28 mm	17"/0.28 mm
Scan Frequency	H: 30-38 KHz V: 50-90 Hz	H: 30-50 KHz V: 50-90 Hz	H: 30-60 KHz V: 50-90 Hz	H: 30-60 KHz V: 50-90 Hz	H: 30-60 KHz V: 50-90 Hz	H: 30-65 KHz V: 50-90 Hz
Max. Resolution	1024x768/87Hz	1024x768/60Hz	1024x768/72Hz	1024x768/72Hz	1024x768/72Hz	1280x1024/60Hz
Digital Control	--	--	--	--	Yes	Yes
Full Screen		Yes	Yes	Yes	Yes	Yes
Low Radiation	5468LR	1451LR	1461LR	1561LR	1560LR	Yes

ISO 9000

Certified Quality

Competitive Pricing

800

1-800-888-2012
BBS (909) 594-8973

Considering a monitor? See your CTX dealer today.

CTX

Monitor Specialists

CTX INTERNATIONAL, INC.
USA HEADQUARTERS
20530 Earlgate Street
Walnut, CA 91789
909 595-6146
Fax 909 595-6293

SOUTH REGION
6090-F Northbelt Pkwy
Norcross, GA 30071
404 729-8909
Fax 404/729-8805

EAST REGION
146 Division Place
Hackensack, NJ 07601
201 646-0707
Fax 201 646-1998

MIDWEST REGION
500 Park Blvd., Ste. 425
Itasca, IL 60143
708 285-0202
Fax 708 285-0212

SOUTHWEST REGION
1225 E. Crosby Rd., A21
Carrollton, TX 75006
214 416-9610
Fax 214 245-7447

CIRCLE 329 ON READER SERVICE CARD

© Copyright 1993 CTX International, Inc. All rights reserved. All brand or product names are trade marks or registered trademarks of their respective owners.

Tutor

BY JEFF PROSISE

A Look at Graphics Drawing Algorithms

Have you ever stopped to think about the work that goes on behind the scenes when your computer draws a simple graphics primitive such as a line or circle? It looks easy. But in fact the process of converting an ideal, mathematically defined line or circle into pixels on the computer screen, a process known as *scan conversion,* is a lot more complicated than it might seem. I learned this the hard way several years ago when I bought an early personal computer that was capable of displaying great graphics but that lacked even the simplest graphics commands. I eventually wrote a modest library of graphics routines, which turned out to be a lot more work than I had bargained for.

Graphical operating systems, such as Windows, Windows NT, and OS/2, and modern language compilers make drawing graphics a snap. Want to draw a line? In Windows or Windows NT, all you have to do is call the system's built-in LineTo() function. If you're writing a DOS program in BASIC, call BASIC's LINE command. Even complex operations, such as painting an irregular area with a pattern of pixels, can often be accomplished with a single command or function call. In this installment of Tutor, we pull back the curtain and take a look at how your PC draws lines and circles and performs simple area fills. This knowledge may not make you a better graphic artist or spreadsheet user, but it will give you a deeper understanding of and appreciation for the sophistication of modern-day graphics subsystems.

LINE DRAWING Consider the task of drawing a line on your computer. With paper, you could take pencil in hand, lay down a straightedge, and draw a line connecting the endpoints. On the computer screen, you must translate the line into discrete pixels connecting the endpoints. The higher the screen resolution—that is, the more pixels you have to work with per inch—the better you can approximate the line; the lower the resolution, the coarser the line will appear. Figure 1 illustrates how a line is scan-converted into individual pixels. Each grid-line intersection represents the location of 1 pixel. The line drawn between the two endpoints represents the ideal line. The black dots are the pixels used to represent the line on the screen.

For each step along the x-axis, the scan-conversion algorithm must compute a whole-number value for y that most closely approximates the line's actual y value at that point. One way to accomplish this is to use the equation for a line

$$y = mx + b$$

where m is the line's slope (if the line's endpoints lie at $x1,y1$ and $x2,y2$, then the slope is the difference between $y2$ and $y1$ divided by the difference between $x2$ and $x1$). A horizontal line has a slope of 0, and a 45-degree line rising upwards as it proceeds from left to right has a slope of 1. The value b is the y-coordinate of the line's point of intersection with the y-axis. By evaluating the expression $mx + b$ for incremental values of x and rounding the resulting y up or down to the nearest whole number, a scan-conversion algorithm can generate a series of x and y pixel coordinates that closely approximates the ideal line. This is line drawing at its simplest.

The problem with this approach to line drawing is that it is slow. The floating-point computations involved in computing y values exact a heavy toll on performance. In 1965, J. E. Bresenham published a line-drawing algorithm that uses only integer math. The vast majority of line-drawing functions today use the Bresenham algorithm or a derivative of it, because calculations involving integers are typically orders of magnitude faster than calculations involving real (fractional) numbers.

As Figure 2 shows, the Bresenham algorithm relies on the fact that an ideal line whose slope is greater than or equal to 0 and less than or equal to 1 intersects a vertical grid line at a point (P) on or above the next pixel (A) to the right of the last pixel drawn and on or below the pixel (B) one above and to the right of the last pixel drawn. If you could compute the value of $\Delta 1$ minus $\Delta 2$ for each unit increment

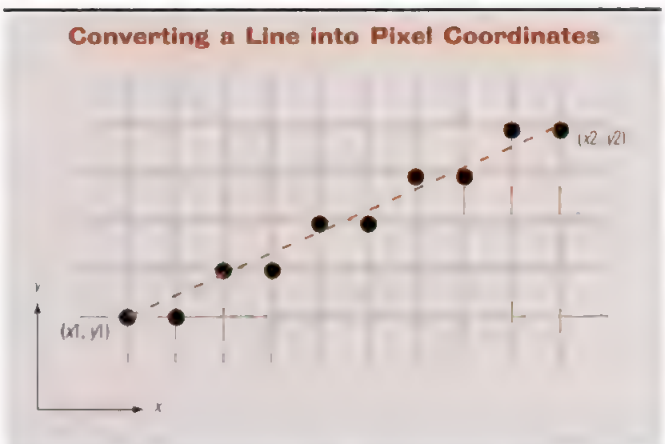


Figure 1: Lines are represented on raster computer screens by illuminating the pixels that lie closest to an imaginary line drawn between two endpoints.

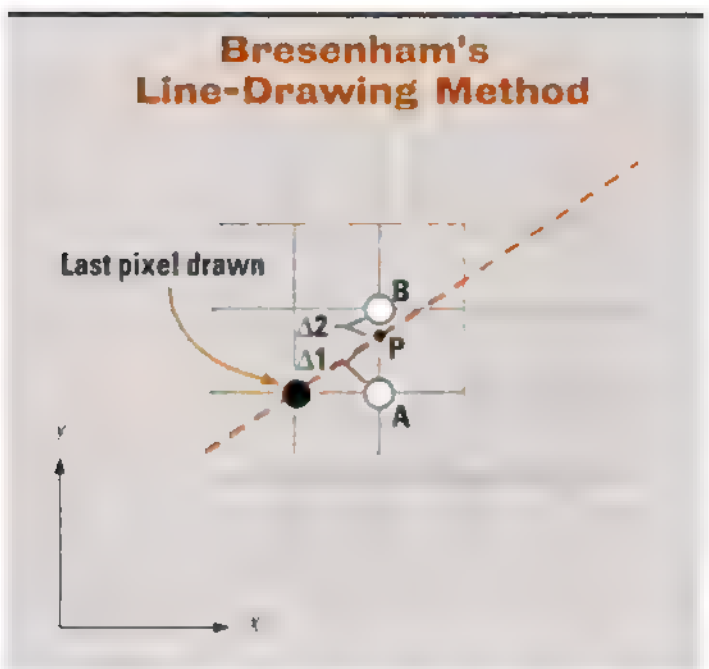


Figure 2: **The Bresenham line-drawing algorithm determines which of two possible pixels to illuminate next, by implicitly comparing Δ1 and Δ2 using simple integer addition and subtraction.**

along the x-axis, you could choose the next pixel to be drawn based upon the sign of the result. A positive value would indicate that the upper pixel should be illuminated, because the distance from the ideal line's point of intersection (P) with the vertical grid line to the upper pixel is shorter than the distance from P to the lower pixel. A negative result would mean that the lower pixel should be lit.

Bresenham's main contribution was a clever way to determine the sign of $\Delta 1$ minus $\Delta 2$ at each step along the way using only integer addition and subtraction. This makes determining which pixel to illuminate a lot easier. The algorithm begins by calculating two values, which we'll call $d1$ and $d2$. These variables are computed at the outset of the procedure from the coordinates of the line's endpoints as follows:

$$d1 = 2 * ((y2 - y1) - (x2 - x1))$$
$$d2 = 2 * (y2 - y1)$$

A third variable, which we'll call d, is set to 0. After initializing d, $d1$, and $d2$ in this manner and setting y equal to the y-coordinate of the line's left endpoint ($y1$), the algorithm loops through integral values of x from $x1$ to $x2$. For each iteration through the loop, d is compared with 0. If d is less than 0, $d2$ is added to d, and y remains the same, implicitly selecting the lower of the two pixels. If d is greater than or equal to 0, $d1$ is added to d, and y is incremented by 1, selecting the higher of the two pixels. The x and y values are plotted at each stop along the way to produce a rasterized line connecting the points at $x1,y1$ and $x2,y2$.

Bresenham's alogrithm is easily generalized for lines whose slopes are not between 0 and 1 and modified to ensure that there aren't uneven runs of pixels. For example, if you want to draw a line with a very small slope, you don't want a row of 20 pixels parallel to the x-axis, then just a couple of pixels on the next higher row, then another row of 20, and so on.

Most graphics programs gain an extra measure of speed by not calculating pixel coordinates directly, but by applying the incremental values of y output from the Bresenham algorithm to addresses in the computer's video buffer.

CIRCLE DRAWING The problem of representing circles on the computer screen is similar to that of representing lines. The scan-conversion algorithm's job is to generate x and y pixel coordinates that most closely represent an imaginary circle inscribed on the screen. Circle coordinates can be computed from the general equation for a circle:

$$r^2 = x^2 + y^2$$

where r is the circle's radius and x and y are the coordinates of a point on the circle's circumference. Doing a bit of algebra on this equation results in the following equation:

$$y = \pm\sqrt{(r^2 - x^2)}$$

which calculates the y-coordinate of any point on the circle. The general approach that circle-drawing algorithms take is to compute the x and y values of pixels defining one octant (one-eighth) of the circle and then to reflect the image around the x- and y-axes and around lines drawn through the center of the circle at 45-degree angles, as shown in Figure 3. The only problem with this approach is that the floating-point computations involved in calculating the square roots of numbers hamper graphics performance.

Once again, Bresenham came to the rescue with an incremental circle-drawing algorithm that relies solely upon integer math. The Bresenham algorithm for calculating the coordinates of the points in the circle's upper-right octant is remarkably similar to the line-drawing algorithm, except that d is initialized to 1.25 minus the circle's radius, and $d1$ and $d2$ are defined as follows:

$$d1 = (2 * (x - y)) + 5$$
$$d2 = (2 * x) + 3$$

Initially, x and y hold the coordinates of the circle's topmost point ($x = 0$, $y = r$). As x is incremented on each iteration through the loop, y is decremented and $d2$ is added to d if d is currently less than 0. If d is greater than or equal to 0, $d1$ is added to d, and y remains the same. All this assumes, of course, that the cir-

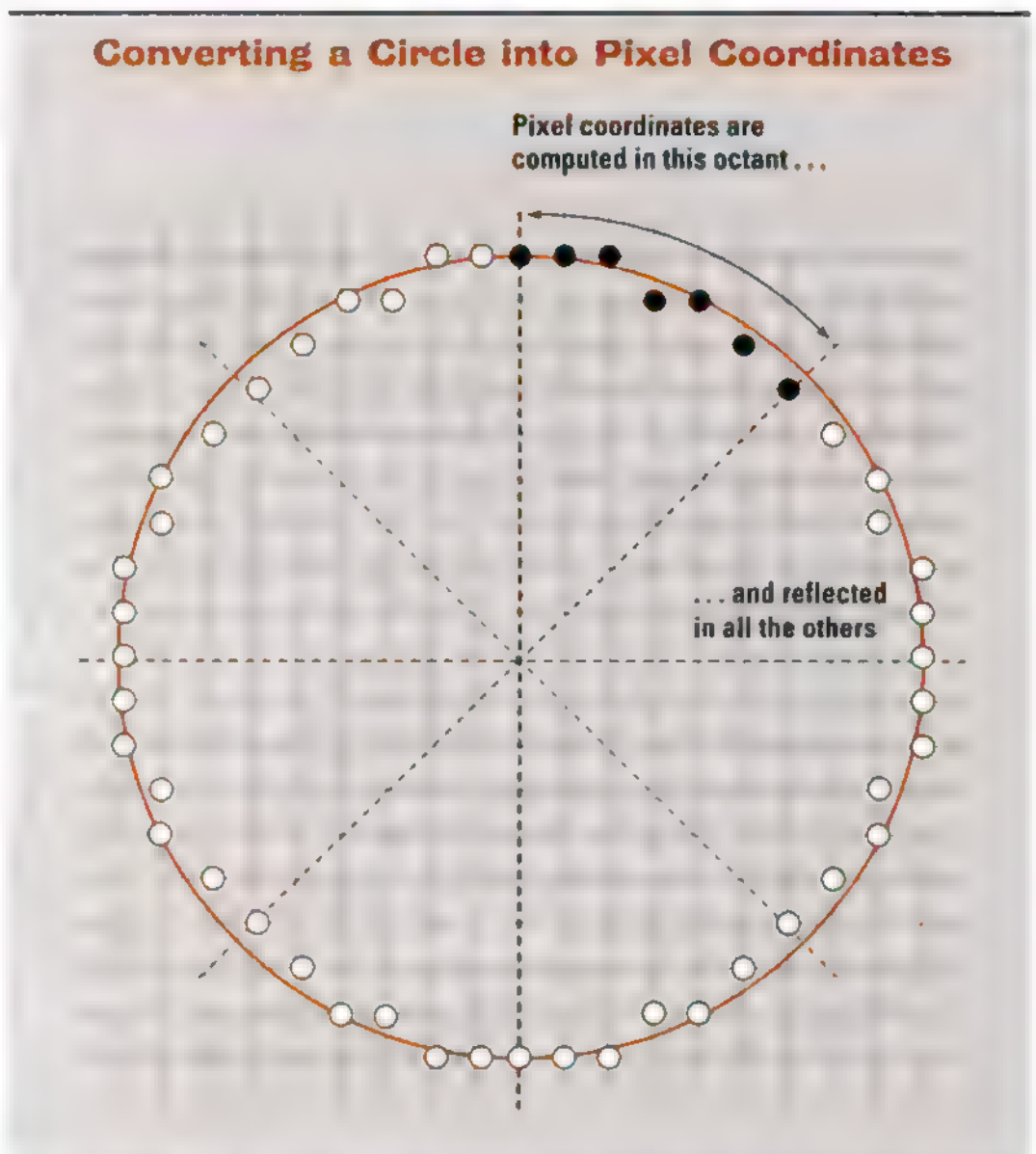


Figure 3: **Circles are drawn on the screen by calculating pixel coordinates for one octant, and then reflecting the image around the x- and y-axes and around lines drawn through the circle's center at 45-degree angles.**

Figure 4: **Irregularly shaped objects such as the one shown on the left pose a challenge for area-fill algorithms. The difficulty is compounded if the object contains islands, as illustrated on the right.**

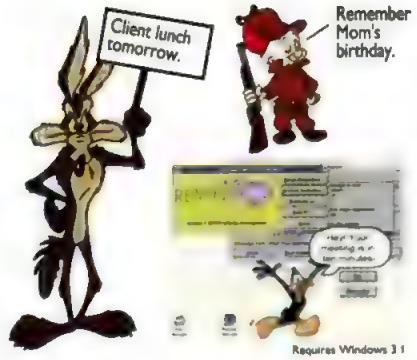
cle's center lies at 0,0. If the center point lies elsewhere, each *x*- and *y*-coordinate pair is offset by the *x*- and *y*-coordinates of the circle's center—again, a simple integer operation.

AREA FILLING Another common operation demanded of graphics subsystems is filling irregularly shaped areas bounded by pixels of uniform color. Simple objects with horizontal and vertical boundaries (such as squares and rectangles) are simple to fill, because you can start in the upper-left corner and draw horizontal lines until the lower boundary is reached or draw vertical lines until the right boundary is reached. But irregular objects, such as the ones shown in Figure 4, pose a more difficult challenge, requiring more imaginative solutions.

The simplest approach is to select an arbitrary pixel (which is often referred to as a *seed* pixel) inside the area to be filled, and to call a routine that recursively calls itself with the coordinates of its four immediate neighbors—left, right, above, and below. Each time the routine is called, it checks the color of the pixel whose coordinates it was passed. If the pixel's color is the boundary color or the fill color, the routine does nothing. If the pixel's color is anything other than the boundary color or fill color, the routine sets the pixel to the fill color and calls itself again for each of the pixel's neighbors. Recursion will ensure that the entire area inside the borders gets filled. The chief drawback to this method is that it is very stack- and memory-intensive. Each call places more information on the program's stack, which in turn consumes more memory. If the region to be filled consists of thousands of pixels, the stack can quickly overflow. Thousands of pixels may seem like a lot, but not when you consider that an area occupying just a quarter of a 640-by-480-pixel screen contains 76,800 pixels.

One alternative approach, the one used by the PAINT command in GW-BASIC and BASICA, is the line-adjacency fill algorithm. The general strategy is to examine and fill not just individual pixels but horizontal runs of pixels. Given the coordinates of a seed pixel, the algorithm scans left and right until it reaches the region's borders and sets every pixel in between to the fill color. Then it calls itself recursively to fill horizontal runs of pixels above and below the current scan line. By viewing the interior of the region as a collection of horizontal lines instead of as individual pixels, the line-adjacency algorithm drastically reduces the number of recursive function calls and therefore its stack and memory requirements. It is also faster than a simple recursive pixel fill, because the video-buffer addresses of horizontally neighboring pixels are easily calculated on most video adapters, requiring nothing more than simple addition or subtraction.

FURTHER STUDY If you want to learn more about contemporary graphics algorithms, let me suggest a couple of books for you. The first is Foley, van Dam, Feiner, and Hughes's classic *Computer Graphics Principles and Practice,* Second Edition (Addison-Wesley, 1987). This book is a comprehensive work that is used by computer scientists around the world and that focuses primarily on the theory underlying common graphics algorithms. For a more practical treatment of graphics-related issues, check out Richard Wilton's *Programmer's Guide to PC & PS/2 Video Systems* (Microsoft Press, 1987). This book is unparalleled in its field and is an excellent vehicle for exploring graphics algorithms as well as their implementations on PC video adapters. □



WHAT'S UP DOC?™

Introducing Remind Me!™ for Windows

The easy and fun way to remember important events.

Animated Looney Tunes characters bring your multi-media computer to life. Plus actual cartoon sound tracks. You choose from over 20 images of Bugs and all his pals that burst onto the screen at the appointed day and time. REMIND ME! also does a lot more.

So, see your software dealer, or call us toll-free at 1-800-VLOCITY.

© 1993 Velocity™ All rights reserved. Velocity and Remind Me! are trademarks of Velocity Development Corporation. Looney Tunes, characters, names and all related indicia are trademarks of Warner Bros. © 1993

CIRCLE 121 ON READER SERVICE CARD

A New Year Multimedia Blowout!

$255

$245

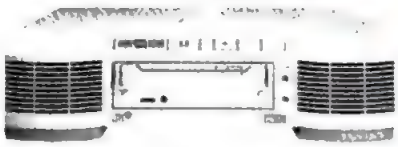
Pro MovieSpectrum

- Create professional desktop videos on your PC
- Smooth real-time capture at 30 frames per second up to 160 × 120
- Still-frame capture with resolutions of 320 × 240 & 640 × 480
- 32,768 vibrant colors
- Includes add-in video card, Microsoft® Video for Windows™ & Macromedia's® Action!

Fusion CD System

- The easy-to-use, plug in & play, multimedia upgrade system
- Includes great sounding, 8-bit, Pro AudioSpectrum Plus sound card
- Five exciting software packages including: Where in the World is Carmen Sandiego, Ultima Underworld, Compton's Family Encyclopedia, Battle Chess, & Wing Commander II

CDPC XL



$605

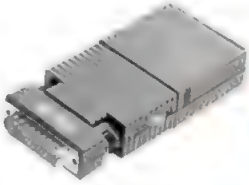
- The first complete, fully-integrated, multimedia solution
- Includes dual-speed SCSI full photo CD compatible CD-ROM drive, amplifier, speakers & MIDI
- Brings high-quality sound to your PC with the best in 16-bit digital audio
- Includes 5 CD-ROM titles: Out of This World, Where in the World is Carmen Sandiego, Compton's Multimedia Encyclopedia & Action

Pro Audio PowerPak

$75

- Allows your PC to follow your every voice command
- Includes ExecuVoice speech recognition and Monologue speech synthesis
- Audio compression and decompression
- Advanced sound editor

Audio Port



$65

- PC Audio device
- High-performance portable module for PCs & notebooks
- Plugs into parallel port of any IBM PC/AT, PS/2 or notebook
- Transport Sound™ technology & built-in-speaker
- Headphone & external speaker outputs

Why Call Resource?

- Order instantly from experienced multimedia sales representatives
- 30 day money back guarantee
- Toll free technical support 7 days a week
- Overnight delivery
- All major credit cards accepted

Call 1-800-684-6699

International customers call (510) 770-8600
Monday thru Friday, 6am to 6pm PST

CIRCLE 130 ON READER SERVICE CARD

© 1993 Media Vision, Inc., 47300 Bayside Parkway, Fremont, CA 94538. (510) 770-8600. Pro MovieSpectrum, PowerPak, CDPC XL, Fusion CD & Audio Port are all trademarks of Media Vision, Inc. Any other trademarks or registered trademarks are the property of their respective holders. Any and all bundled software and prices are subject to change without notice.

MEDIA VISION RESOURCE

Corporate Developer

BY SAL RICCIARDI

Database Design: Redundancy and Normalization

One of the major goals of good database design is the removal of data redundancy. To accomplish this goal, you divide your information into many narrowly defined tables so that each fact is represented only once (the credo to remember here is "one fact, one place"). Then you provide your database management system (DBMS) with the means by which to join the divided information back together again—by placing common columns into tables that are somehow related. To perform this step correctly, however, you must first understand table relationships.

UNDERSTANDING TABLE RELATIONSHIPS

Let's consider Sam's Bookstop database, a simplified example database that includes a Book table, a Publisher table, and an Author table. A publisher can publish any number of different books. It follows that for any one publisher represented in the Publisher table, there can be more than one book represented in the Book table. The relationship between the Publisher table and the Book table is said to be a one-to-many relationship, because for any one publisher in the Publisher table, there can be many books in the Book table.

To represent a one-to-many relationship in your database design, take the primary key of the *one* table and add it as an additional column to the *many* table. (Remember that the primary key is the column chosen to identify each row in the table.) For example, in the book database we'll take the primary key of the Publisher table, PubID, and place it in the Book table, as shown in Figure 1. The DBMS can then use these common columns to join together the information in the two tables. For example, to find the publisher for a particular book, the DBMS connects the PubID from the Book table to the matching PubID in the Publisher table.

Notice in Figure 1 that each table's primary key is annotated with (PK), and the PubID columns in the Book table are annotated with (FK). A foreign key (FK) is simply another table's primary key. In this case, the PubID field in the Book table is called a foreign key, because it's also the primary key in the Publisher table. As you can tell from Figure 1, you provide the basis for connecting related tables by establishing primary key–foreign key pairings. If you're not sure which tables need to share a common column, identifying a one-to-many relationship is a sure sign that the two tables involved will indeed require a common column.

One major goal of good database design is the removal of data redundancy. To achieve this, you must understand table relationships.

Another type of table relationship is the one-to-one relationship. For instance, suppose you need to record some special supplementary book information that you'll only need to access on rare occasions. Because you don't need the information often, you place it in a supplemental table so that it doesn't crowd the main Book table. As you did in the Book table, you use the BookID as the primary key. The relationship between this supplemental table and the Book table is said to be a one-to-one relationship. That is, for each record in the Book table, there exists a single matching record in the supplemental table. When you do identify such a relationship, both tables must share a common field.

Now let's consider the relationship between the Author table and the Book table. Although most books are written by a single author, some are collaborative efforts among several individuals. That means that for any given book, there can be more than one author. On the other hand, an author can write more than one book. That means for any particular author, there can be many books. This type of relationship among authors and books is called a many-to-many relationship, because for any one book there can many authors, and for any one author there can be many books.

As a rule, you create a many-to-many relationship by creating a third table that is used to record each occurrence (which is also called an *instance*) of the relationship. For example, consider Figure 2. Here, the many-to-many relationship between the Author table and the Book table is represented by a third table, the Author/Book table. From this table you can determine those books written by Van Wolverton (those with Wolverton's AuthID) and those books written by Dan Gookin (those with Gookin's AuthID). You can also determine that both authors collaborated on *Supercharging MS-DOS*, because both authors have a record in the Author/Book table with that book's BookID (000017). With this design, you might add additional columns to the third table (such as the Order column shown) to differentiate the primary author from other authors or to record the order of the author's names on the book jacket, for example.

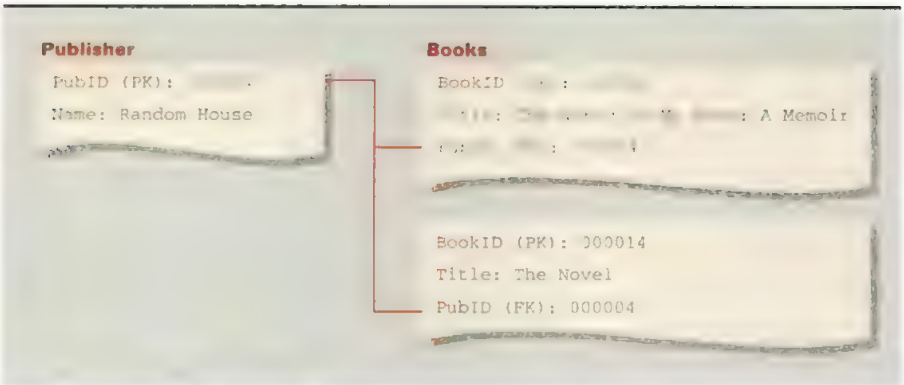


Figure 1: **A one-to-many relationship between publisher and books.**

Note that the Author table contributes its primary key, AuthID, to the Author/Book table and the Book table contributes its primary key, BookID. When you represent a many-to-many relationship, each of the two tables contributes it's primary key to the third table. The combination of the two—AuthID plus BookID—serves as the Author/Book table's primary key.

You probably also noticed that the many-to-many relationship represented by the third table is actually two one-to-many relationships: The relationship between the Author table and the Author/Book table is one-to-many, and the relationship between the Book table and the Author/Book table is one-to-many. Determining the relationships between tables helps you make sure you have the right tables and columns. When a one-to-one or one-to-many relationship exists, the tables involved need to share a common column or common columns. When a many-to-many relationship exists, a third table is needed to represent the relationship.

Because removing duplication is a major goal when you're designing a database, you might be concerned about the possible repeated appearance of PubID foreign key values in the Book table. After all, there are likely to be many books with the same PubID. This type of duplication is necessary. You can think of the repeated appearance of foreign key values (such as those that might appear in the PubID column) as good duplication, duplication required for table linkage. Don't confuse good duplication with bad duplication, which is any duplicated data not required for table linkage.

REFINING THE DESIGN Once you have a preliminary design, you should create and populate your tables with sample data and try working with the information: issuing commands, creating queries, adding new records, and so on. This will help reveal places where you might need to add a column that you forgot to include earlier or where you should split one table into two tables in order to remove duplication.

The data normalization rules are basically a set of guidelines you use as a design aid, to see if your tables are structured correctly.

When reviewing your table structures, look out for repeating groups. For example, consider a table with the columns

PubID
Pubname
BookID1
Title1
BookID2
Title2
BookID3
Title3

Here each book is a repeating group of columns made different from the others by adding a number to the end of the column name (columns so numbered are evidence of a design that requires closer scrutiny).

Such a design has several flaws. For starters, it forces you to place an upper limit on the number of books you can include. As soon as you exceed that limit, you must add a new group of columns to the table structure, a fairly major administrative task. Another problem is that those publishers that have fewer than the maximum number of books will waste some space, since the additional book columns will be blank. But probably the most serious flaw is that such a design makes many tasks difficult to perform, such as sorting or indexing the table by book ID or title.

Whenever you see repeating groups, review the design closely with an eye on splitting the table in two. In the above example, it is better to use two tables—one for publishers and one for books—linked by publisher ID.

In reviewing and refining the design, ask yourself the following questions:

- Are there any missing columns? Create a column for every information item that you need to track. If an item can't be calculated from the other existing columns, chances are you'll need a column for it.
- Are any columns unnecessary because they can be calculated from columns that already exist? If an information item can be calculated from other existing columns—a discounted price calculated from the retail price, for instance—it's usually better to do just that and avoid creating a new column. Most DBMS packages let you place calculations in reports and queries.
- Has each information item been broken into its smallest useful parts? If you need to report, sort, search, or calculate on an item of information, put it in a column by itself.
- Does each column contain a fact about the table's subject? If a column does not contain information about the table's subject, it belongs in a different table.
- Are all relationships between tables represented either by common fields or by a third table? One-to-one and one-to-many relationships require common columns. Many-to-many relationships require a third table.

DATA NORMALIZATION RULES The data normalization rules are basically a set of guidelines you use as a design aid, to see if your tables are structured correctly. The process of applying the rules to your database design is called normalizing the database, or just normalization.

Normalization is most useful after you've represented all of the data items and have arrived at a preliminary design. It's basically a formal way of applying ideas that might seem intuitive or obvious to some, but it can help you ensure that you've divided your data items into the appropriate tables. What normalization cannot do is ensure that you have all the correct data items to begin with.

You apply the rules in succession, at each step ensuring that your design arrives at one of what is known as the normal forms. Five normal forms are widely accepted and are called the first normal form through the fifth normal form. I'll discuss only the first three here, since they are all that is required for most database designs. For a more in-depth treatment of data normalization, please consult the references that I have listed at the end of this column.

FIRST NORMAL FORM (1NF) First normal form requires that the intersection of a column and row in the table contains a single value, never a list of values. For example, you cannot have a field named Title in which you place more than one book title. If you think of each row/column intersection as a cell, each cell can hold only one value.

SECOND NORMAL FORM (2NF) Second normal form requires that each non-key column be fully dependent on the entire primary key, not just on part of the key. This rule applies when you have a primary key that is composite (that is, a primary key that consists of more than one column). Consider the table structure

AuthID (PK)
BookID (PK)
Order
Author name

Here, the primary key consists of AuthID plus BookID. This structure violates 2NF, because Author name is dependent on AuthID, but not on BookID. Thus, it is not dependent on the entire primary key. You'd notice this problem as soon as you create a sample table, because Author name would be repeated wherever AuthID is repeated. The redundancy would be obvious.

THIRD NORMAL FORM (3NF) Third normal form requires not only that every non-key column be dependent on the entire primary key but that non-key columns be independent of each other. Another way of saying this is that each non-key column must be dependent on the primary key and nothing but the primary key. For example, consider the structure

BookID (PK)
Title
SRP
Discount

Assume that Discount depends on the suggested retail price (SRP). This structure violates 3NF because we have a non-key column, Discount, dependent on another non-key column, SRP. Column independence basically means you should be able to change any non-key column without affecting any other column. In this example, if you change the SRP, the Discount would change accordingly, thus violating the rule. In this case, the Discount field should be moved to another table keyed on SRP.

UNDERSTAND THE BUSINESS You might have noticed that each step in the normalization process takes you one step closer to a seemingly simple goal, which is that all columns must be strictly relevant to the primary key. Such a determination isn't always obvious, however. For example, how do you know what data items are related to each other or what data items are relevant to the primary key?

The answer is you must understand the real-world meaning of the data, not to mention the business rules associated with the data. This implies that the designer or design team must become business experts first to understand the data relationships and the business rules. Otherwise, all of the design guidelines, techniques, and rules will be of little help.

FOR FURTHER READING If you're interested in delving deeper into the subject of database design, I recommend the following books:

- *Designing Quality Databases with IDEF1X Information Models,* Thomas A. Bruce, Dorset House, New York, New York, 1992
- *Handbook of Relational Database Design,* Candace C. Fleming and Barbara von Halle, Addison-Wesley, Reading, Massachusetts, 1989

THE MAILBOX Send comments, questions, or suggestions to Dale Lewallen, senior editor (MCI, 338-5922; CompuServe, 72241,1773), or to Sal Ricciardi, contributing editor (MCI, 347-7663; CompuServe, 72241,33). □

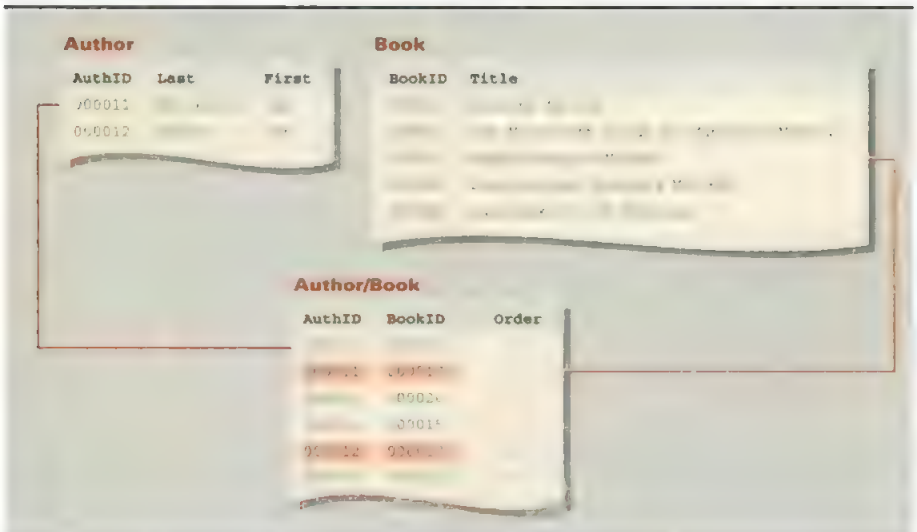


Figure 2: **A many-to-many relationship between authors and books.**

SAL RICCIARDI IS A CONTRIBUTING EDITOR OF *PC MAGAZINE* AND AUTHOR OF *RUNNING MICROSOFT FOXPRO FOR WINDOWS* AND *RUNNING MICROSOFT FOXPRO FOR MS-DOS,* FROM MICROSOFT PRESS.

COMING SOON! LAS VEGAS CONVENTION CENTER, 2-6 MAY 1994.

THE BEST AND THE BRIGHTEST. ALL UNDER ONE ROOF.

NETWORLD + INTEROP 94

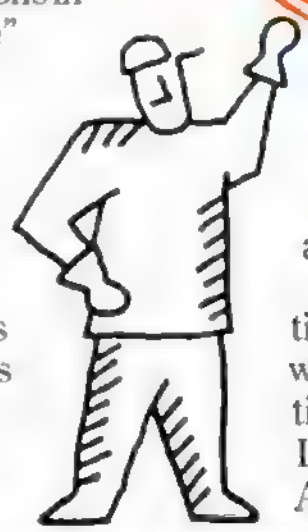
Introducing NetWorld+Interop 94—the most important networking and computing event on earth.

It's the show that had to happen.

NetWorld+Interop 94 was created specifically to mirror the changes in networking itself—the convergence of LAN, WAN and telecommunications in today's "information everywhere" business environment.

How do you satisfy user needs when products and technologies are constantly changing? How do you make buying decisions that stand the test of time? Seeing *all* your alternatives working in one place at one time is the only real way to find out.

Imagine, more than 600 of the world's leading networking and computing suppliers all under one roof. Demonstrating the latest technologies. Letting you test drive products and see them work together on the InteropNet, a live multi-vendor, multi-protocol network that connects all vendors.



What's more, industry gurus will tell you about what's here now and what to expect. And university-level conferences and tutorials provide a chance to learn and exchange ideas with the industry's best and brightest.

And now, for the first time, NetWorld+ Interop 94 will be held in five international business centers—Las Vegas, Berlin, Tokyo, Atlanta and Paris.

No matter which one you attend, you'll see first hand how the world's most innovative products and technologies can give you a competitive edge.

All brought to you by Interop Company, the industry's premier producer of networking and computing events and exhibitions.

For information about attending or exhibiting at this unparalleled networking event, call 1-800-488-2883. Outside the U.S., call 415-941-3399, or contact us over the Internet at networld@interop.com.

Better than NetWorld. Better than Interop. It's one event you can't afford to miss.

BE THERE.

NetWorld+Interop 94 is produced by Interop Company.

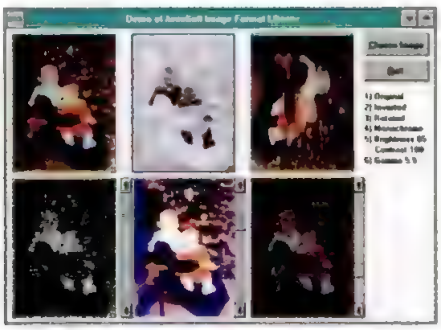
Toolkits

BY NEIL J. RUBENKING

AccuSoft: Instant Image Processing

Need to display or manipulate images in your programs? AccuSoft Image Format Library, Version 4.0, is *guaranteed* to read any image in many supported formats. If you find an image that it can't read, within one week AccuSoft Corp. will send you an updated version of the library that will read the image. That's quite a claim, but the product's impressive customer list and a 30-day money-back guarantee suggest that it's not an idle boast. The Standard version costs $495, and you pay no royalties for under 25,000 copies per year.

The AccuSoft library functions make it incredibly simple to write a program that can read, display, print, and manipulate image files or convert them to different formats. We examined the 16-bit, Windows DLL version of the library. Other versions run under Windows NT, 16- and 32-bit DOS, and OS/2. You can also purchase the library as a set of 16- or 32-bit .VBX custom controls. Source code is available at extra cost. The function set is almost identical in all these versions. The DOS version supports only HP scanners; 32-bit PRO Gold versions add enhanced image-processing functions and anti-aliasing. Also, the volume cutoff for paying royalties is lower for the 32-bit PRO Gold versions.



This simple Microsoft Visual Basic program uses AccuSoft Image Format Library to display a scanned photograph along with several modified versions.

ONE FUNCTION FOR ALL FORMATS You only need to learn one function—IMG_decompress_bitmap()—to read a file in any one of these formats: .BMP, .DCX, EPS, .GIF, JPEG, .PCT, .PCX, .RLE, Targa, TIFF, .WMF, or .WPG. Nonstandard Group III and Group IV fax images are supported too. However, the library routines can't know the size and nature of the file's header in advance, so the programmer is responsible for opening the file and positioning the file pointer to the actual start of data. Other library functions read from an already open file (to handle embedded images) or from a memory image of a file. If Twain scanner support is installed, two functions let the user select a Twain device and acquire an image from the scanner.

All of AccuSoft's image-reading functions return a handle to an AccuSoft-specific data structure, which is used by nearly all the other library functions. It's possible to obtain a standard Windows DIB (device-independent bitmap) handle for use with standard Windows bitmap-management functions, and you can convert the image to a DDB (device-dependent bitmap) for faster display and special effects such as wipes.

The IMG_display_bitmap() function displays an image on the specified Windows device context, with automatic scaling. IMG_bitmap_palette() will realize the image's palette (map its colors to the system palette). Other images using a different palette may not display correctly when a new palette is realized, so AccuSoft provides the low-level function IMGLOW_autocolor() to improve the display of multiple images with different palettes. Saving the image in any of the supported file formats is as simple as calling IMG_save_bitmap(), and printing is equally simple. Thus, it takes just a handful of functions to create a complete image display and conversion program.

EASY IMAGE MANIPULATION Once an image is loaded, the library provides numerous functions for modifying it. At the simple end are functions to zoom, scroll, resize, rotate, and flip. Other functions adjust the sharpness, contrast, brightness, and gamma correction of the image. There are ten different functions, employing different algorithms, which convert an image so it uses more or fewer bits per pixel. Finally, IMG_process_bitmap() performs one of ten image-processing routines, including several varieties of edge detection, depending on the parameters you pass to it.

The manual mainly consists of a list of all the functions in the library, with descriptions of their parameters and code samples. The image processing options aren't explained, but the product comes with several example programs and their source code.

If you need to write a program that can work with images from many sources or can manipulate images in many ways, AccuSoft will make your job easy.

• AccuSoft Image Format Library, Version 4.0

List Price: *Standard 16-bit versions (DOS, VBX, or Microsoft Windows DLL), $495; Silver 32-bit versions (NT, OS/2, VBX32, or Phar Lap or Watcom DOS extenders), $995; PRO Gold 32-bit versions (Win32 or Phar Lap or Watcom DOS extenders), $1,995.* Requires: *Microsoft Windows 3.0 or later, a compiler that supports calls to DLLs. AccuSoft Corp., 112 Turnpike Rd., #109, Westboro, MA 01581; 800-525-3577, 508-898-2770; fax, 508-898-9662.*

Circle 493 on reader service card

THE NEW WORKPLACE™

[Sharp JX-9460PS *600 dpi Laser* Printer]

"Hey, now we look like a big-time outfit."

It gives you high-quality 600 dpi laser printing. With PostScript® & PCL5 compatibility. It gives you near typeset-quality text and graphics. And even Sharp's award-winning reprographics. You can use it with any PC or MAC®.* In an office of 3 or 300. You get 6 fast pages per minute. You get faster output from a RISC processor. And here's what you also get: a smaller electric bill-it's got a "sleep mode" energy saver, a small footprint-just 1.3 sq. ft., even a small price. All this for under $1,199 (MSRP). It's the new Sharp JX-9460PS 600 dpi Laser Printer. And with it, you have the power to make anyplace, your workplace.

1-800-BE-SHARP
Or FastFax 201-529-9113

SHARP
FROM SHARP MINDS COME SHARP PRODUCTS™
CIRCLE 161 ON READER SERVICE CARD

LCD

COPIERS • FACSIMILE • LASER PRINTERS • NOTEBOOK COMPUTERS • COLOR SCANNERS • PERSONAL DIGITAL ASSISTANTS • CALCULATORS
CORDLESS TELEPHONES • TYPEWRITERS • WORD PROCESSORS • WIZARD' ORGANIZERS

Also see the JX-9400, a 300 dpi laser printer for under $599(MSRP)

©1993 Sharp Electronics Corporation. PostScript® is a registered trademark of Adobe Systems, Inc. Mac® is a registered trademark of Apple Computer, Inc. *Requires AppleTalk Interface

Environments

BY CHARLES PETZOLD

Extended Pen Creation Under Windows NT

In our real (that is, noncomputing) lives, we draw lines using pencils, pens, markers, crayons, paints, and at one time—going back to our early years—baby food. Each of these drawing tools renders lines with a unique appearance, texture, and personality. Paint can even look different depending on whether it's applied with brushes, a spray can, or the fingers.

In Windows, the line-drawing tool is called simply the pen. Rather than picking a pen from a vast inventory, you create a logical pen object by specifying its characteristics and then selecting it into a device context. Subsequent lines drawn on the screen or by the printer are rendered with that pen.

In the last installment of this column, we examined CreatePen(), a function supported under Windows since Version 1.0 and only moderately enhanced since that time. CreatePen() and its cousin, CreatePenIndirect(), let you specify a pen style (solid or composed of fixed sequences of dots and dashes), a width in logical units, and a color. There are restrictions, however: Dotted and dashed pens must have a width of 1 pixel, and in most cases, pen colors are not dithered. The exception is the PS_INSIDEFRAME pen style, which uses dithered colors for widths of 2 pixels or more.

Windows NT continues to support the CreatePen() and CreatePenIndirect() functions with only minor changes. Windows NT also includes a new function called ExtCreatePen() that can do everything CreatePen() does and more. That's what we'll look at in this issue.

PEN WIDTHS Before approaching extended pen creation under Windows NT, you need to become familiar with some new terminology involving pen widths. Like the OS/2 Graphics Programming Interface (GPI), Windows NT distinguishes between pens having a geometric width and pens having a cosmetic width. The difference is simple: The width of a geometric pen is specified in logical units. That is, the pen width is subject to the mapping mode and other transforms. The width of a cosmetic pen is specified in device units (pixels), and the width is not affected by the mapping mode or transforms.

The classic example of using geometric and cosmetic pens is in architectural drawing: You'd use a geometric pen for drawing the walls of the building. If you then zoom in on the drawing using a transform, the walls will appear wider, as they should. However, dimension lines should be drawn with cosmetic pens. There is no reason for these lines to be wider when you zoom in on the drawing; indeed, it might seem disturbing if they were. Also, Windows draws lines with cosmetic pens faster than lines with geometric pens.

Here's where it gets messy, though. If you read the overview on pens and the documentation of the CreatePen() function in the *Microsoft Win32 Programmer's Reference*, you'll encounter some errors. Both sections claim that CreatePen() creates a cosmetic pen. Not true. As I discussed in the last issue, you use CreatePen() to specify the pen width in logical units. For example, if you specify a pen width of 25 units, this will be 25 pixels when you're using the MM_TEXT mapping mode, 0.25 inches with the MM_LOENGLISH mapping mode, or 0.25 millimeters with MM_HIMETRIC. That's a geometric pen.

As you'll also recall, CreatePen() lets you specify a pen width of 0. In that case, the pen is 1 pixel wide regardless of the mapping mode and other transforms. That's a cosmetic pen.

Unfortunately, the Windows NT enhancements to pen creation do not include a facility to create a cosmetic pen wider than 1 pixel. Thus, if you want a wider pen not subject to the mapping

COSUSER.MAK

Complete Listing

```
#-----------------------
# COSUSER.MAK make file
#-----------------------

!include <ntwin32.mak>

cosuser.exe : cosuser.obj ntgdi.obj ntgdi.rbj
    $(link) $(guiflags) -out:cosuser.exe cosuser.obj ntgdi.obj \
            ntgdi.rbj $(guilibs)

cosuser.obj : cosuser.c
    $(cc) $(cflags) $(cvars) cosuser.c

ntgdi.obj : ntgdi.c ntgdi.h
    $(cc) $(cflags) $(cvars) ntgdi.c

ntgdi.rbj : ntgdi.rc ntgdi.h
     $(rc) $(rcvars) -r ntgdi.rc
     cvtres -$(CPU) ntgdi.res -o ntgdi.rbj
```

Figure 1: **COSUSER.MAK facilitates compilation and linking of the COSUSER program.**

COSUSER.C

Complete Listing

```
/*----------------------------------------
   COSUSER.C -- Cosmetic Pen User Style
                (c) Charles Petzold, 1993
  ----------------------------------------*/

#include <windows.h>

char szClass [] = "CosUser" ;
char szTitle [] = "CosUser: Cosmetic Pen User Style" ;

void PaintRoutine (HWND hwnd, HDC hdc, int cxArea, int cyArea)
     {
     DWORD    dwBits [] = { 8, 8, 16, 8 } ;
     LOGBRUSH lb ;

     lb.lbStyle = BS_SOLID ;
     lb.lbColor = RGB (0, 0, 0) ;
     lb.lbHatch = 0 ;

     SelectObject (hdc,
          ExtCreatePen (PS_COSMETIC | PS_USERSTYLE, 1, &lb, 4, dwBits)) ;

     Rectangle (hdc, cxArea / 4, cyArea / 4, 3 * cxArea / 4, 3 * cyArea / 4) ;

     MoveToEx (hdc,     cxArea / 4,     cyArea / 4, NULL) ;
     LineTo   (hdc, 3 * cxArea / 4, 3 * cyArea / 4) ;

     MoveToEx (hdc,     cxArea / 4, 3 * cyArea / 4, NULL) ;
     LineTo   (hdc, 3 * cxArea / 4,     cyArea / 4) ;

     DeleteObject (SelectObject (hdc, GetStockObject (BLACK_PEN))) ;
     }
```

Figure 2: **COSUSER.C demonstrates the user style of cosmetic pens.**

mode and other transforms, you'd have to use a 1-pixel cosmetic pen and draw two or three lines adjacent to each other.

This is one area where OS/2 has a better idea (at least in theory). In GPI, cosmetic pens have a width that is not subject to transforms but that is not specified in pixels either. The device driver defines a normal width that is appropriate for the device. For most video displays, this is generally 1 pixel. But for high-resolution video displays or laser printers, the width can be wider than 1 pixel. Then (in theory) you can specify larger or smaller line widths that are fractions or multiples of the normal width. This is only in theory: OS/2 currently limits cosmetic lines to a normal width and a double width.

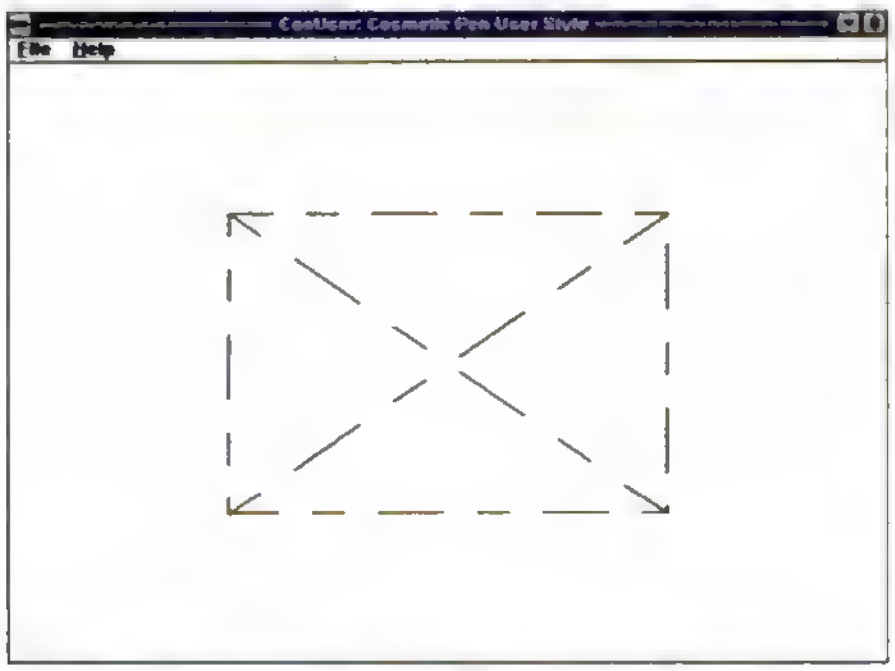


Figure 3: **The COSUSER program shows a cosmetic line with a customized series of dashes.**

EXTENDED PEN CREATION Whenever the Windows designers come up with a new function that is similar to an old function but somewhat better, they give it the same name but with an Ex appended to the end or an Ext stuck on the beginning. (I've yet to discern any rhyme or reason to the two naming schemes.) Under Windows NT, the extended pen-creation function is named ExtCreatePen(), and it has five parameters:

```
hPen = ExtCreatePen (dwStyle,
  dwWidth, &logbrush, dwCount,
  &dwBits) ;
```

The first two parameters are defined the same way as for CreatePen(); they indicate the pen style and the width. As you'll recall, the third and last parameter to CreatePen() is the pen color. In ExtCreatePen(), the third parameter is a pointer to a LOGBRUSH structure that has three fields:

```
typedef struct tagLOGBRUSH
     {
     UIT        lbStyle ;
     COLORREF   lbColor ;
     LONG       lbHatch ;
     }
     LOGBRUSH ;
```

At first, the structure may seem out of place here. The LOGBRUSH structure is normally used to define the characteristics of a brush you use for filling areas. We'll see how you use this structure with pens later in this column and in the next issue.

The last two parameters to ExtCreatePen() let you create pens with a customized series of dots and dashes, which I'll demonstrate shortly.

Although the first parameter to ExtCreatePen() is defined the same way as CreatePen(), there are several more style options. Moreover, rather than being mutually exclusive, you can combine different style flags with the C bitwise OR operator (|). First, you can use either PS_COSMETIC or PS_GEOMETRIC, specifying whether you want a cosmetic or geometric pen. PS_COSMETIC is defined as 0, so it's the default if you don't use either flag. Let's begin with cosmetic pens because they're simpler and have fewer options.

COSMETIC PENS When you use the PS_COSMETIC flag as the first parameter to the ExtCreatePen() function, you can combine it with the following style flags: PS_SOLID, PS_DASH, PS_DOT, PS_DASHDOT, PS_DASHDOTDOT, PS_NULL, PS_USERSTYLE, and PS_ALTERNATE. Six of these styles are the same as those supported under CreatePen(): You can pick a solid pen, a NULL pen (which doesn't draw anything), or four variations of dotted and dashed pens.

Windows NT supports two additional styles: PS_ALTERNATE creates a pen in which every other pixel is colored. PS_USERSTYLE allows you to specify

GEOWIDTH.MAK
Complete Listing

```
#-----------------------
# GEOWIDTH.MAK make file
#-----------------------

!include <ntwin32.mak>

geowidth.exe : geowidth.obj ntgdi.obj ntgdi.rbj
    $(link) $(guiflags) -out:geowidth.exe geowidth.obj ntgdi.obj \
            ntgdi.rbj $(guilibs)

geowidth.obj : geowidth.c
    $(cc) $(cflags) $(cvars) geowidth.c

ntgdi.obj : ntgdi.c ntgdi.h
    $(cc) $(cflags) $(cvars) ntgdi.c

ntgdi.rbj : ntgdi.rc ntgdi.h
     $(rc) $(rcvars) -r ntgdi.rc
     cvtres -$(CPU) ntgdi.res -o ntgdi.rbj
```

Figure 4: **GEOWIDTH.MAK facilitates compilation and linking of the GEOWIDTH program.**

a custom series of dots or dashes. I'll discuss this option shortly. Notice that the PS_INSIDEFRAME style is not valid for cosmetic pens, which makes sense because cosmetic pens can be only 1 pixel wide and the PS_INSIDEFRAME style is the same as the PS_SOLID style for pens of that width. For cosmetic lines, the second parameter to ExtCreatePen() must be set to 1, meaning that the pen will be 1 pixel wide.

The LOGBRUSH structure (the third parameter) is used solely to specify the pen color, which is converted to the nearest pure color that is realizable on the device. Set the lbStyle field of the LOGBRUSH structure to BS_SOLID (a solid brush) and set the lbColor field to an RGB color value. The lbHatch field can be set to 0.

The last two parameters to ExtCreatePen() are used only with the PS_USERSTYLE field. If you don't use PS_USERSTYLE, set the two parameters to 0 and NULL, respectively.

Because ExtCreatePen() provides a superset of functionality over CreatePen(), reconciling the two functions should be easy, and it is: Specifying a pen width of 0 in CreatePen() is the same as creating a cosmetic pen with ExtCreatePen() except you specify a width of 1 pixel. The pen color is not a separate parameter but part of the LOGBRUSH structure. Plus, two new styles are available: PS_ALTERNATE and PS_USERSTYLE.

THE USER STYLE The PS_USERSTYLE flag is one of several versatile enhancements ExtCreatePen() has over CreatePen(). If you're not satisfied with the existing dotted and dashed pen styles, you can create your own. For example, suppose you want an 8-unit dash followed by an 8-unit space, followed by a 16-unit dash, followed by an 8-unit space, repeated over and over. First you need an array of double-word values indicating the lengths of the dashes and spaces. It would look like this:

```
static DWORD dwBits [4] = {8, 8,
 16, 8};
```

Use this array as the last parameter to ExtCreatePen(). The second to last parameter of the function gets the number of values, which in this case is 4. Under most circumstances, you'll have an even number of values: a length of a dash, then a space, and so on.

Let's take a look at this feature with a sample program called COSUSER (cosmetic user style), shown in Figures 1 and 2. To compile and link this program, you'll need the NTGDI files discussed in the last issue. You can download them as well as this issue's sample programs from PC MagNet's Programming forum archived as COUSE.ZIP.

COSUSER creates a user-style cosmetic pen, draws a rectangle in the client area, and connects opposite corners of the rectangle with straight lines. The results are shown in Figure 3.

GEOWIDTH.C
Complete Listing

```
/*----------------------------------------
   GEOWIDTH.C -- Geometric Line Widths
                 (c) Charles Petzold, 1993
  ----------------------------------------*/

#include <windows.h>

char szClass [] = "GeoWidth" ;
char szTitle [] = "GeoWidth: Geometric Line Widths" ;

void PaintRoutine (HWND hwnd, HDC hdc, int cxArea, int cyArea)
     {
     int      y, iWidth  ;
     LOGBRUSH lb ;

     lb.lbStyle = BS_SOLID ;
     lb.lbColor = RGB (0, 0, 0) ;
     lb.lbHatch = 0 ;

     for (y = 20, iWidth = 1 ; iWidth <= 20 ; y += 20, iWidth++)
          {
          SelectObject (hdc,
               ExtCreatePen (PS_GEOMETRIC | PS_DASHDOT,
                             iWidth, &lb, 0, NULL)) ;

          MoveToEx (hdc,           20, y, NULL) ;
          LineTo    (hdc, cxArea - 20, y) ;

          DeleteObject (
               SelectObject (hdc,
                    GetStockObject (BLACK_PEN))) ;
          }
     }
```

Figure 5: **GEOWIDTH.C demonstrates wide-style pens.**

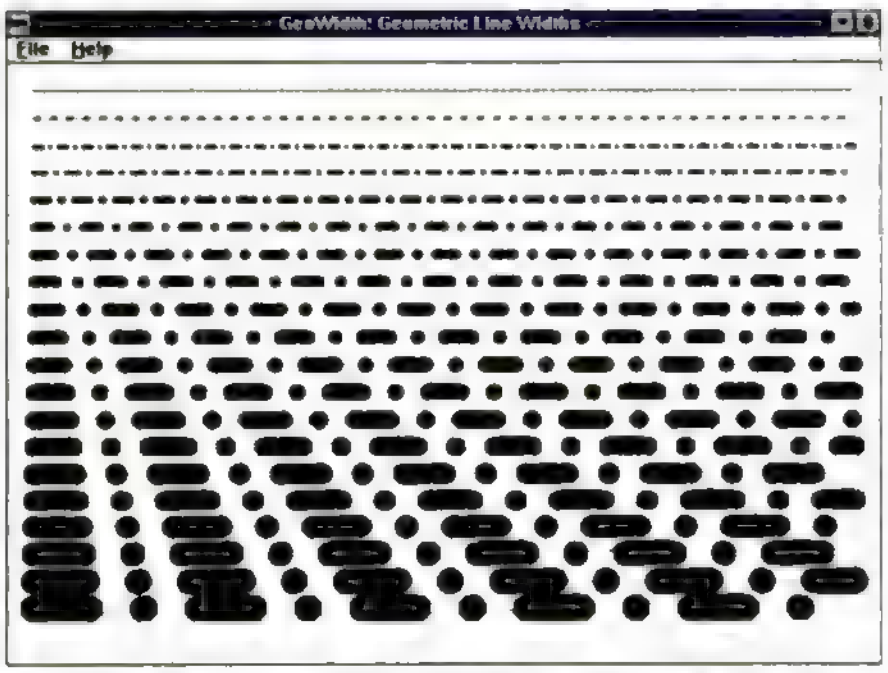


Figure 6: **The GEOWIDTH display shows how line style dimensions change with line width.**

Now we come to a puzzle: If the width of a cosmetic line is specified in pixels, how are the lengths of the dashes and spaces specified? Well, they're referred to in *Microsoft Win32 Programmer's Reference* as "style units." That's nice and descriptive, isn't it? One thing is for sure: They are not pixels.

A little experimentation and pixel counting reveals that a style unit on a VGA is 3 pixels in length. Thus, the first dash in the above sequence is 24 pixels wide. On my 300 dpi PostScript laser printer, a style unit seems to be about 12 pixels, accounting for the difference in resolution between the two devices. These style units thus add a layer of device independence to using PS_USERSTYLE with cosmetic pens. Think of a style unit as being about 1/25 inch regardless of the device.

GEOMETRIC PENS With geometric pens, you have a few more options. When you specify the PS_GEOMETRIC style as the first parameter to ExtCreatePen(), you can use any of the style parameters for CreatePen() as well as PS_USERSTYLE: PS_SOLID, PS_DASH, PS_DOT, PS_DASHDOT, PS_DASHDOTDOT, PS_NULL, PS_USERSTYLE, and PS_INSIDEFRAME. You can't use PS_ALTERNATE. That is only for cosmetic pens.

We're not finished with style flags yet. When you draw thick geometric lines, other appearances beyond color and width become important. In particular, what do the ends of the lines look like? Are they round or square? Three other style identifiers let you specify that appearance: PS_ENDCAP_ROUND, PS_ENDCAP_SQUARE, and PS_ENDCAP_FLAT. The default is round if you choose not to use one of these three flags. The square end is a little different from the flat end: The flat end cuts off the line right at the point where the line would end if it were not thick. The square end extends the thick line by half its width.

When you're drawing polylines (or other connected lines), another concern is the appearance of the joins. This is specified by one of the following pen-style identifiers: PS_JOIN_ROUND, PS_JOIN_BEVEL, and PS_JOIN_MITER. The round join (the default) is round, the bevel join is cut off, the miter join is a point. You'll see what these look like shortly.

The second parameter of ExtCreatePen() specifies the line width in logical coordinates. Use values of 1 or higher. Interestingly enough, when you use one of the predefined dash or dot styles, the length of the dots and dashes increase when you have wider lines. In particular, the dots stay round, as I'll demonstrate.

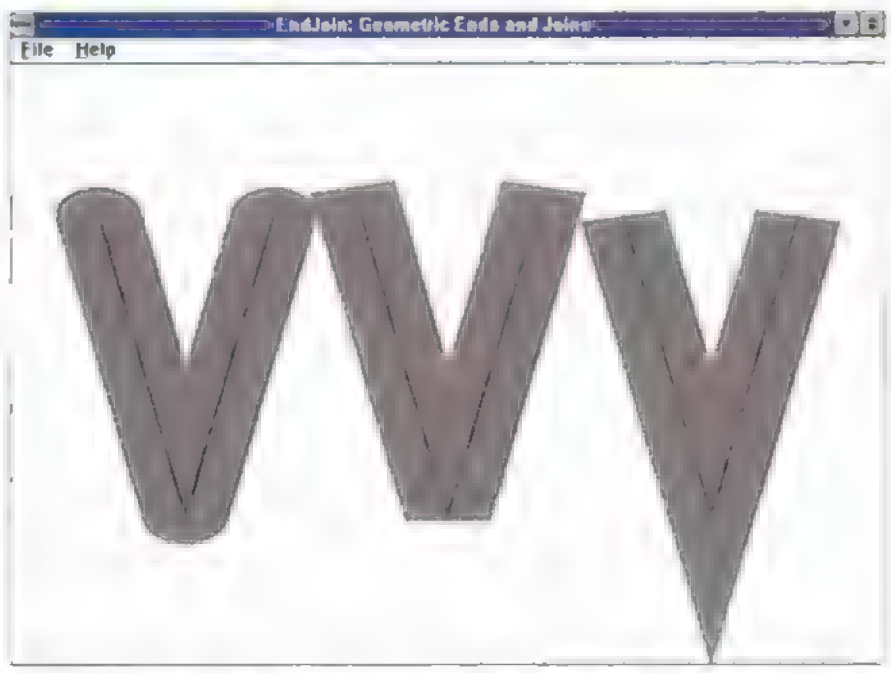


Figure 8: **The ENDJOIN display shows the three types of line ends and joins.**

The third parameter to ExtCreatePen() is a pointer to a LOGBRUSH structure. A LOGBRUSH structure is used to describe a filling pattern for areas, so it may seem out of place in a pen creation function. But if you're drawing thick lines, using a fill pattern rather than just a color adds visual versatility. If you just want a colored pen, set the lbStyle field to BS_SOLID and the lbColor field to an RGB value. GDI will use a dithered color if the color you specify is not available on the device. (If you don't want a dithered color, call GetNearestColor() before setting the lbColor field.)

When you use PS_USERSTYLE with a geometric pen, you specify the lengths of the dashes and spaces the same way as with cosmetic pens, but the lengths are specified in logical coordinates rather than style units.

TAKING A LOOK One limitation of CreatePen() is that you can't use any of

ENDJOIN.MAK

Complete Listing

```
#-----------------------
# ENDJOIN.MAK make file
#-----------------------

!include <ntwin32.mak>

endjoin.exe : endjoin.obj ntgdi.obj ntgdi.rbj
    $(link) $(guiflags) -out:endjoin.exe endjoin.obj ntgdi.obj \
            ntgdi.rbj $(guilibs)

endjoin.obj : endjoin.c
    $(cc) $(cflags) $(cvars) endjoin.c

ntgdi.obj : ntgdi.c ntgdi.h
    $(cc) $(cflags) $(cvars) ntgdi.c

ntgdi.rbj : ntgdi.rc ntgdi.h
     $(rc) $(rcvars) -r ntgdi.rc
     cvtres -$(CPU) ntgdi.res -o ntgdi.rbj
```

Figure 7: **ENDJOIN.MAK facilitates compilation and linking of the ENDJOIN program.**

ENDJOIN.C
Complete Listing

```
/*----------------------------------------
   ENDJOIN.C -- Geometric Ends and Joins
                (c) Charles Petzold, 1993
  ----------------------------------------*/

#include <windows.h>

char szClass [] = "EndJoin" ;
char szTitle [] = "EndJoin: Geometric Ends and Joins" ;

void PaintRoutine (HWND hwnd, HDC hdc, int cxArea, int cyArea)
     {
     static DWORD aiEnd  [] = { PS_ENDCAP_ROUND, PS_ENDCAP_SQUARE,
                                PS_ENDCAP_FLAT } ;
     static DWORD aiJoin [] = { PS_JOIN_ROUND,   PS_JOIN_BEVEL,
                                PS_JOIN_MITER } ;
     int          i ;
     LOGBRUSH     lb ;
     POINT        pt [3] ;

     SetMapMode (hdc, MM_ANISOTROPIC) ;
     SetWindowExtEx (hdc, 100, 100, NULL) ;
     SetViewportExtEx (hdc, cxArea, cyArea, NULL) ;

     lb.lbStyle = BS_SOLID ;
     lb.lbColor = RGB (128, 128, 128) ;
     lb.lbHatch = 0 ;

     for (i = 0 ; i < 3 ; i++)
          {
          SelectObject (hdc,
               ExtCreatePen (PS_SOLID | PS_GEOMETRIC | aiEnd [i] | aiJoin [i], 10,
                             &lb, 0, NULL)) ;

          pt[0].x = 10 + 30 * i ;  pt[0].y = 25 ;
          pt[1].x = 20 + 30 * i ;  pt[1].y = 75 ;
          pt[2].x = 30 + 30 * i ;  pt[2].y = 25 ;

          Polyline (hdc, pt, 3) ;

          DeleteObject (
               SelectObject (hdc,
                    GetStockObject (BLACK_PEN))) ;

          Polyline (hdc, pt, 3) ;
          }

     }
```

Figure 9: **ENDJOIN.C demonstrates line ends and joins.**

the dotted or dashed styles with pens wider than 1 pixel. ExtCreatePen() removes that restriction, as demonstrated in the GEOWIDTH program shown in Figures 4 and 5. GEOWIDTH is based on the LNWIDTH program shown in the last issue. It draws 20 lines that range in thickness from 1 to 20 pixels, using a PS_DASHDOT styled pen. As you can see in Figure 6, Windows NT behaves as I described: The dashes and dots get longer with increasing line width.

The three line ends and three line joins are demonstrated in the ENDJOIN program shown in Figures 7 and 9. The program uses the Polyline() function to draw three V-shaped figures, using a wide line and a gray color. The ENDJOIN window is shown in Figure 8. From left to right, the three ends are round, square, and flat, and the three joins are round, bevel, and miter. The program also draws the same figure using a stock black pen, showing the points where the lines actually begin and end.

So far, I haven't been making much use of the LOGBRUSH structure, restricting myself to a solid brush of a particular color. Brushes can have various hatch styles or can be made out of bitmaps. We'll explore this facility in the next issue. □

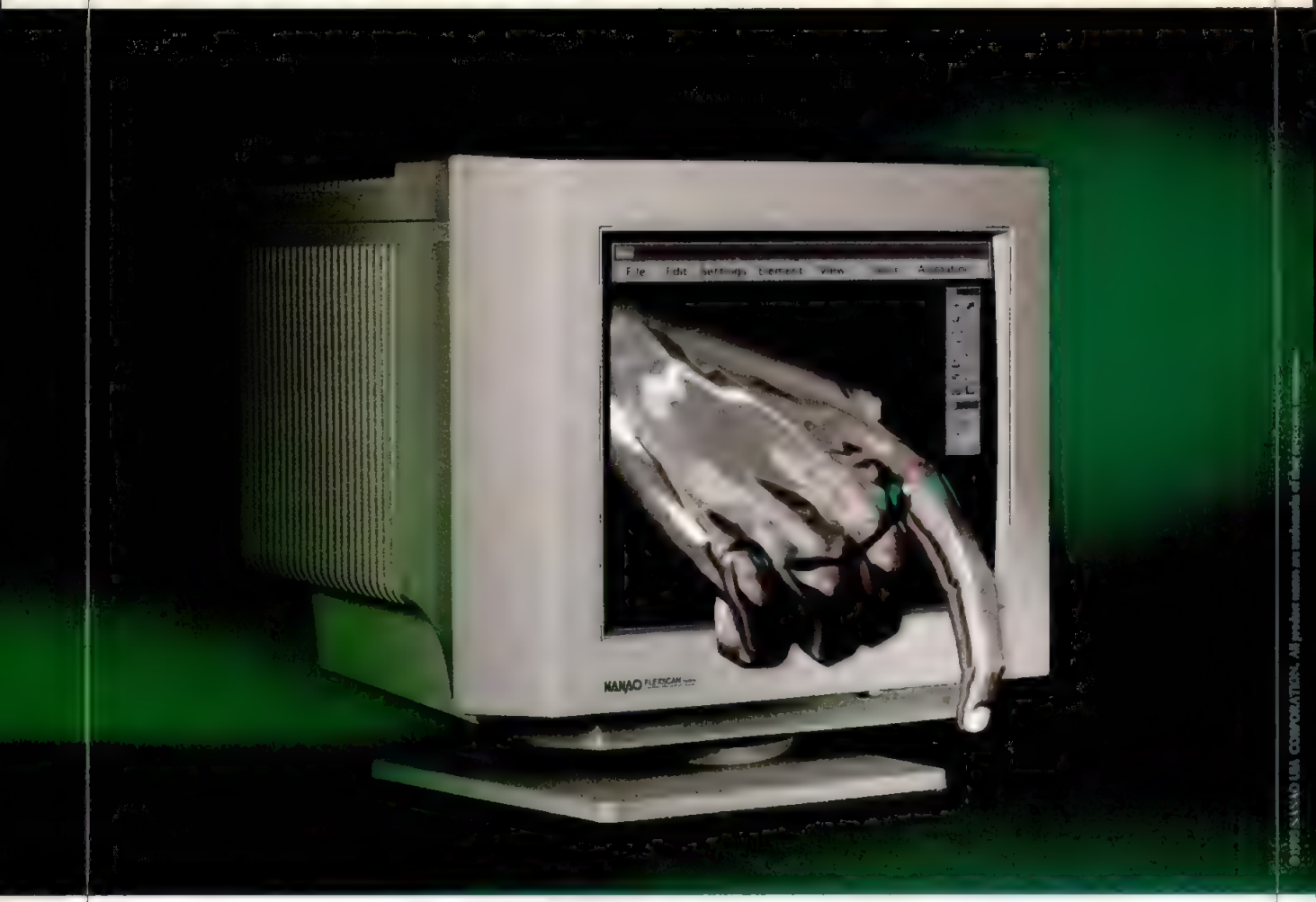
VB Power

ISBN: 1-56276-073-4
Price: $34.95

This innovative guide by Dan Appleman turns Visual Basic programmers into power users by illuminating the tools of the Windows Application Program Interface (API). Includes a time-saving disk that contains source code from the examples in the text, plus a specially designed dynamic link library (DLL).

Available at fine bookstores, or call 1-800-688-0448 ext. 8448

© 1993 Ziff-Davis Press



SO ADVANCED IT EVEN TURNS ITSELF OFF.

PC MAGAZINE EDITORS' CHOICE
September 14, 1993
Nanao FlexScan F550i W

1993 W 100 WINDOWS MAGAZINE ANNUAL WIN AWARD
FlexScan F550i

Nanao, the technical leader in monitors has done it again. In addition to being the top choice of today's CAD/CAM, DTP and Windows users, Nanao's award-winning FlexScan monitors now have a remarkable energy-saving system – PowerManager.

PowerManager works with all green computer systems including VESA DPMS (Display Power Management Signaling). But users don't have to own a new green computer in order to take advantage of the PowerManager to save energy. Our PowerManager works with any existing PCs with a screen saver software, including Windows 3.1 and After Dark. Activating when the blank screen of the screen saver appears, PowerManager cuts operating power to less than 8% of total consumption. It also automatically powers the monitor down to a stand-by mode when the computer is turned off. The PowerManager can save users as much as $63 per year on utility bills (Source: E Source). PowerManager has placed Nanao at the forefront of the Environmental Protection Agency's Energy Star Program.

PowerManager is now the standard feature of our 15", 17", 20" and 21" monitors. All Nanao energy-saving monitors feature superior Invar Shadow Mask and Trinitron CRTs with non-flicker ultra-high resolution. Their ergonomic features include compliance with MPR-II/TCO low radiation emission standards and anti-reflective treatments. Best of all, they can power down. So when you're not working, neither are they.

Nanao FlexScan monitors. Intelligently designed. Incredibly useful. And now, built to help protect our environment by reducing energy consumption.

*The Energy Star emblem does not represent EPA endorsement of any product or service.

FREE AFTER DARK

PC MAGAZINE MVP 92 WINNER
FlexScan T660i

NANAO USA CORPORATION
23535 Telo Avenue, Torrance, CA 90505
(310) 325-5202

NANAO
Superior In Every Detail

1-800-800-5202

CIRCLE 283 ON READER SERVICE CARD

Power Programming

BY KAARE CHRISTIAN

C++ Template Technology

Cloning is not just for the biotech world, it's also a time-honored activity for programmers. But in the past, we've cloned and replicated code using a simple but effective tool, the text editor. Today C++ offers us a better way to clone our code: templates.

A common reason to clone existing code is to change data types. For example, suppose you wrote a drawing routine that uses integer *x* and *y* coordinates, and you need the same routine, except you want it to use longs for the coordinates. You could use an editor to duplicate the existing code and change the data types. With C++, you could even take advantage of overloaded functions and use the same function name for each version. Overloaded functions make for clearer code, but they still mean you must maintain the same algorithm in multiple places within your program.

A C solution to this problem is to use macros. Although macros let you write the code just once, there are disadvantages as well. First, it's only practical for very simple functions. A second serious shortcoming is that macros do not provide any type-checking and thus circumvent a major benefit of C++. A third disadvantage is that macros insert the specified code, rather than just a call to a function, every time they're used, and this can bloat your executable.

Templates provide a better solution by separating the general algorithm from its type-specific implementation. You can write code now and fill in the types later. This is possible because the data type itself is a parameter. With templates, you get both the write-it-once benefit of macros and the type-checking of overloaded functions.

Not every C++ compiler supports templates. Templates are present in Symantec C++ 6.0, Borland C++ 3.1, MetaWare High C/C++ 3.1, and Watcom C/C++ 9.5. Templates are not yet available in Microsoft Visual C++. Although templates have not yet been accepted by the ANSI committee as part of the C++ standard, the basic usage presented here is accepted and unlikely to change significantly. There are two types of templates in C++, function templates and class templates.

In the past, we've cloned code using a simple but effective tool, the text editor. Today C++ offers us a better way to clone our code: templates.

FUNCTION TEMPLATES Let's start with a function template that raises a value to a power:

```
template <class T>
T toPower(T base, int exponent);
```

Template function declarations start with a prefix, which consists of the `template` keyword followed by a template parameter list (see Figure 1). The one gotcha is the word `class` in the template parameter list, which has an expanded meaning in this context. In a template parameter list, `class` can also refer to an ordinary data type. Thus, the template parameter list <class T> simply means T represents any type, which will be supplied later. Since T is a parameter that stands for a type, templates are sometimes called parameterized types.

Here's the definition of the template function:

```
template<class T>
T toPower(T base, int exponent)
{
  T result = base;
  if (exponent == 0)
       return (T)1;
  if (exponent < 0)
       return (T)0;
  while(--exponent)
       result *= base;
  return result;
}
```

The variable result is of type T, so when the return value is 1 or 0, it is first cast as type T to match the template function declaration.

The template data-type argument is filled in according to the data types used to call the function:

```
int i = toPower(10, 3);
long l = toPower(1000L, 4);
long double d = toPower((long
 double)1e5, 5);
```

In the first example, T becomes an int. In the second, it becomes a long. And in the third example, T becomes a long double. The following example will generate a compiler error because it mixes data types:

```
int i = toPower(1000L, 4);
```

TEMPLATE ARGUMENT REQUIREMENTS The template function toPower() can be used for almost any data type. The "almost" caveat results from the operations on both the base parameter and the result variable that are made inside the toPower() function. Whatever type you use with toPower() must support these operations. Otherwise, the compiler won't know what to do. Here's a list of the operations performed in toPower() on the

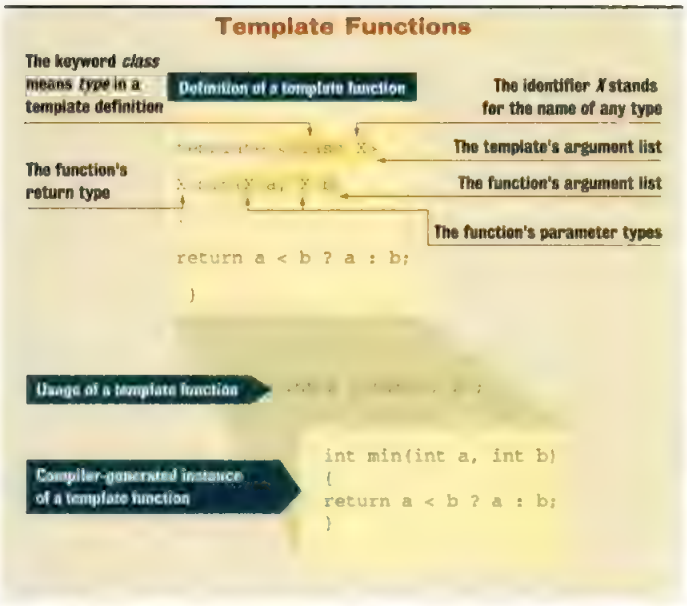


Figure 1: **The data types used by template functions are not defined in advance.**

variables `result` and `base`:

```
1. T result = base;
2. return (T)1;
3. return (T)0;
4. result *= base;
5. return result;
```

All these operations are supported for built-in types. But if you create a toPower() function for a class data type—for example, Roman numerals—then that class must include public member functions to provide these capabilities:

- Operation 1 initializes a T object, so class T must contain a copy constructor.
- Operations 2 and 3 convert an int into to a T object, so class T must contain a constructor that takes an int argument, because that's how classes implement conversions to the class type.
- Operation 4 uses the *= operator on type T, so the class must contain an operator*=() function.

The skeleton of such a class is

```
class Q {
  public:
   Q(Q& base); //copy constructor
   Q(int i); //cast from int to Q
   operator*=(Q base);
  // . . . other functions
};
```

When you use classes with template functions, be sure you know what operations are used in the template function, and be sure those operations are supplied by the class. If you don't supply necessary functions, the error messages will be varied and obscure.

ARGUMENT TYPE MATCHING Because template functions are generated by the compiler according to the data used to call them, it's crucial that you pass correct types—especially when the template function takes two or more arguments. The classic max() function provides a good example:

```
template <class T>
T max(T a, T b)
{
   return a > b ? a : b;
}
```

The max() function will work smoothly if both arguments are the same type:

```
int i = max(1, 2);
double d = max(1.2, 3.4);
```

But max() will generate an error if the arguments are different types, because the compiler can't figure out what to do.

One way to resolve the ambiguity is to use a cast in order to clarify your intentions:

```
int i = max((int)'a', 100);
```

A second option is to explicitly declare a version of a template function before calling it:

```
int max(int, int);
int j = max('a', 100);
```

Another way to manage the problem is to create a template function that takes two different data type arguments.

```
template <class T1, class T2>
T1 max(T1 a, T2 b)
{
   return a > (T1)b ? a : (T1)b;
}
```

With this new version of max(), it's not ambiguous to use max() with two types. For example, if you write

```
max('a', 100)
```

then the compiler will use the two supplied types and build a max() with the signature

```
char max(char, int);
```

Then the compiler casts the second argument as the type of the first argument before making the comparison. This works, but using two type parameters for functions that should operate with only one type is often the worst choice because it's arbitrary. It's hard to remember that

```
max('a', 100)
```

returns a char result, while

```
max(100, 'a')
```

returns an int result.

TEMPLATE CLASSES You can also create template classes that can work their magic on any type of data. The classic example is a container class, such as a set. Using a template, you can create a generic set class. Then you can create specific sets for colors, strings, and so on.

Let's look first at a truly trivial example, just to get acclimated to the syntax. The example shown here is a class that stores three values. The members of the class return the minimum and maximum values and let you determine if all three of the values are different. Because this is a template class, the values can be almost any type.

```
template <class T>
class Trio {
  public:
    Trio(T t1, T t2, T t3);
    T Max();
```

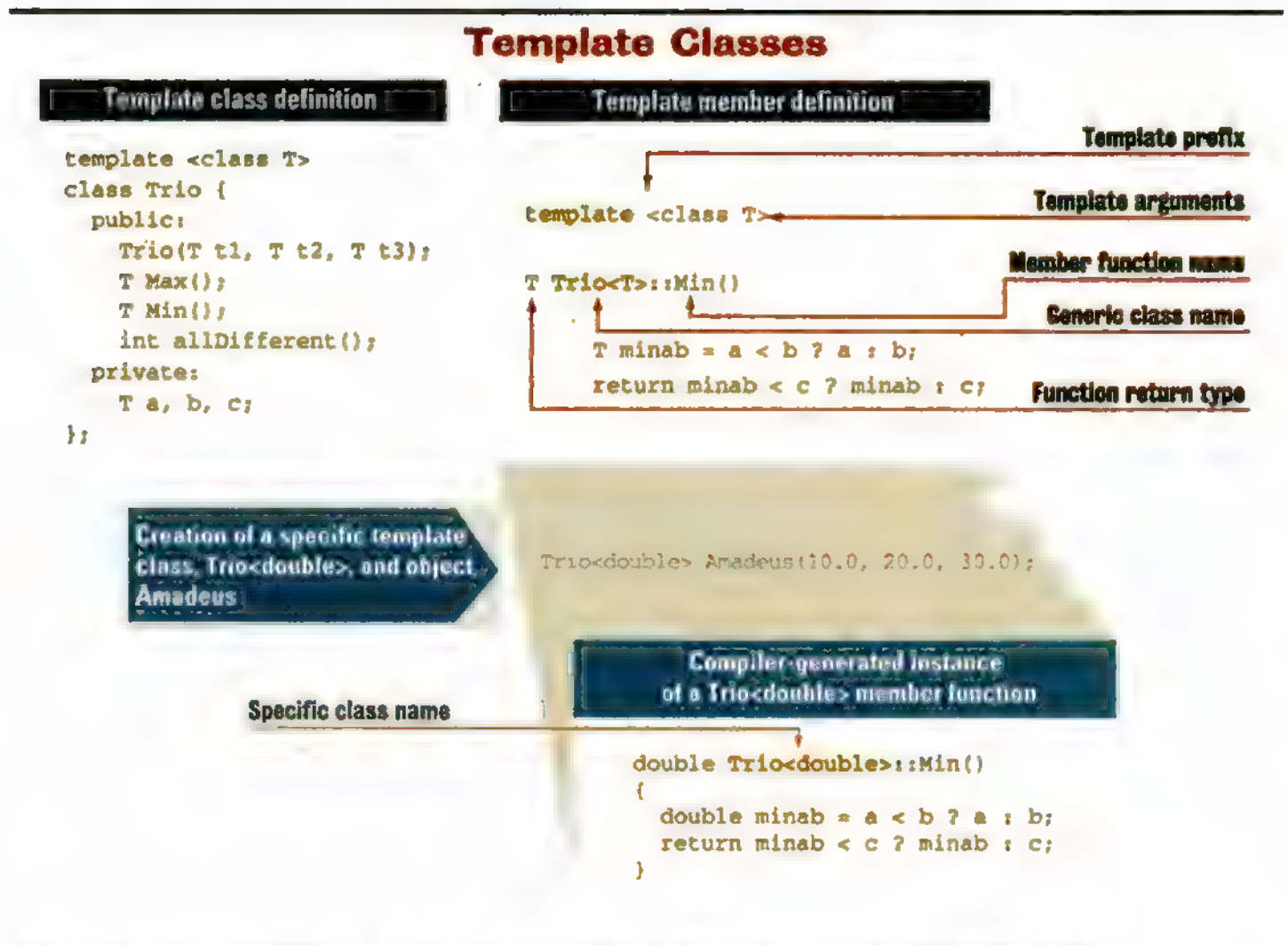


Figure 2: **In template classes, member functions are declared in a type-independent manner.**

```
    T Min();
    int allDifferent();
  private:
    T a, b, c;
};
```

So far, things look pretty much like function templates. The only difference is that a class definition is used in place of the function definition. Template classes start to get more complex when you define the class members. For example, here's the definition of Trio's Min() member function:

```
template <class T>
T Trio<T>::Min()
{
    T minab = a < b ? a : b;
    return minab < c ? minab : c;
}
```

To understand this, let's retreat slightly. If Trio were a normal (nontemplate) class and T were a specific type, Trio's Min() function would be defined like this:

```
T Trio::Min()
{
    T minab = a < b ? a : b;
    return minab < c ? minab : c;
}
```

For the template version, first we need to add the template prefix:

```
template <class T>
```

Next we need a name for the class. Remember that we're defining a set of classes, a family of Trios. In meek mimicry of template prefix syntax, a Trio class for ints is called Trio<int>, one for doubles is called Trio<double>, one for Vectors is called Trio<Vector>, and so on. But in the definition of a member function, we need to use the generic class name Trio<T>. This makes sense because that template prefix indicates that T stands for any type name. For a diagram of the syntax, see Figure 2. Figure 3 shows the code for the remaining member functions of the Trio class.

Earlier I mentioned that the template functions will only work for data types or classes that support all the necessary operations. The same is true for template classes. To create a Trio of some class type—for example, class X—that class must have the following public member functions:

```
X(X&);  // a copy constructor
int operator==(X);
int operator<(X);
```

These three member functions are required because they implement the operations that are performed on T objects in the Min() member function. (I'm assuming the other three member functions will use the same operations.)

When you're using someone else's template class, how do you know what operations are required? If the template class is documented, the requirements should be stated in the documentation.

Trio Member Functions

```
// constructor - initialize a, b, and c
template <class T>
Trio<T>::Trio(T t1, T t2, T t3) :
   a(t1), b(t2), c(t3)
{
   return;
}

// MAX - return the max of a, b, and c
template <class T>
T Trio<T>::Max()
{
   T maxab = a < b ? b : a;
   return maxab < c ? c : maxab;
}

// allDifferent - true if a, b, and c differ
template <class T>
int Trio<T>::allDifferent()
{
   if (a == b) return 0;
   if (b == c) return 0;
   if (a == c) return 0;
   return 1;
}
```

Figure 3: **These member-function definitions are placed in the TRIO.H header file, because they need to be visible wherever the Trio class is used.**

If not, you must look at the ultimate documentation, the source code. Also note that this requirement doesn't really apply to using template classes with built-in types, because built-in types support all the standard operations.

CLASS TEMPLATES: NOT JUST FOR TYPES

Parameterizing a class so it works with any data type is just half of what templates can do for classes. The other half is to supply numeric parameters. This lets you do things such as create a Vector that stores 20 ints, a Vector that stores 1000 ints, or a Vector that stores 10 doubles.

The basic idea is simple, though the syntax can get complex. Let's use a generalization of the Trio class as an example. The new class is called Ensemble, because an Ensemble is just a Trio that gained a few players. The Ensemble class has the same functions as Trio—Min(), Max(), allDifferent()—but there can be any number of players, not just three. In Trio, the players were specified as arguments to the constructor. In the Ensemble template class, a second parameter to the template prefix is used instead:

```
template <class T, int nPlayers>
class Ensemble {
  public:
    Ensemble();
    ~Ensemble() { delete []
     players; }
    void newPlayer(T p);
    T Max();
    T Min();
    int allDifferent();
  private:
    T* players;
    int curPlayer;
};
```

The nPlayers value that's specified in the template prefix isn't used in the class definition, but it is used in the member-function definitions. The Ensemble constructor, which uses the nPlayers value to specify the size of the array, is

```
template <class T, int nPlayers>
Ensemble<T, nPlayers>::Ensemble() :
    players(new T[nPlayers]),
    curPlayer(0)
{
    return;
}
```

The constructor uses an initialization list to initialize the two class data members. The `players` data member is initialized with the address of a dynamically allocated array of T that's nPlayers long, and curPlayer is initialized to 0.

There are several alternatives to using templates with value parameters to dynamically create arrays of differing sizes. For example, you can pass the array size to the constructor. Specifying sizes during construction or by calling some member function does let you specify something's size, but it doesn't create a separate type for each separate size. What happens with the template approach is that the size becomes part of the type. An Ensemble of five doubles is a different type than an Ensemble of four doubles.

Whether you want different sizes to be different types depends on your needs. If comparing an Ensemble of five players with an Ensemble of four doesn't make sense, then making them different types is ideal. On the other hand, in a set of matrix classes, you might not want different types for each size of matrix, because there are many operations, such as cross products, that work with matrices of different sizes. When you encounter this problem, you want runtime sanity checking, not compile-time type checking.

While numeric template parameters are often used to specify collection sizes, as shown in the Ensemble class, they are not limited to this role. For example, in a graphics class they might specify the coordinate ranges.

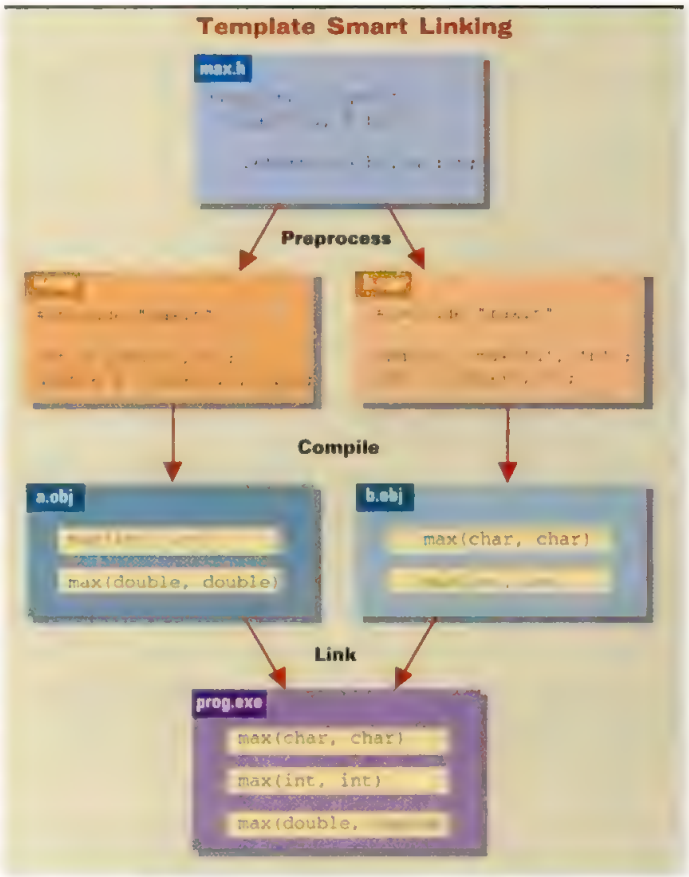


Figure 4: **In Borland's smart-linking scheme, duplicate template instances are eliminated during linking. Other compilers offer similar linking features.**

COMPILING AND LINKING TEMPLATES

C++ templates are easy enough to write, but they present a significant challenge to compilers and linkers. The compiler cannot generate code for a template when it first encounters the definition but instead must wait until the template is used with specific data types. From the programmer's standpoint, this means that the full definition of a template function or template class must appear every place the template is used. Otherwise, the compiler won't have the information it needs to generate the code. Things tend to get even more complicated when a template is used in more than one source file.

The techniques for handling the complexities vary from compiler to compiler. I'm going to describe the options available in Borland C++, Version 4.0. There are two basic ways to compile and link templates. The first method, which Borland calls Smart, is the easiest for the programmer. Template code is generated in

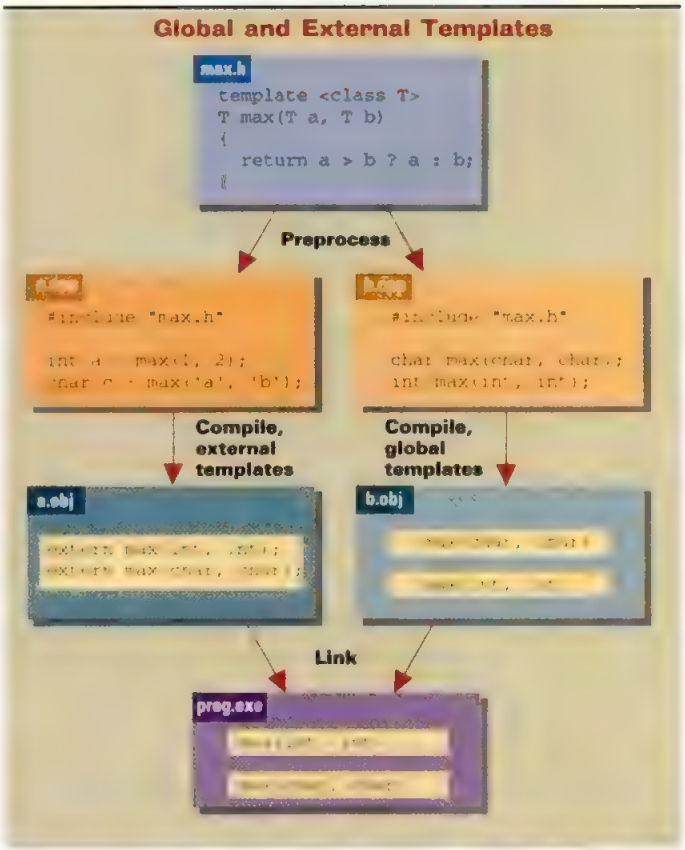


Figure 5: **Borland's global and external linking options mimic ordinary, nontemplate linking.**

each source file as needed, and duplicates are eliminated by the linker.

To understand where the duplicates are coming from, consider the following example: Let's say we have a project with two source code files—A.CPP and B.CPP—plus a template function called max() that is defined in the header file MAX.H (see Figure 4). Both A.CPP and B.CPP include MAX.H. If A.CPP uses an int and a double version of max(), the compiler will create int and double executable versions of max() in A.OBJ. If B.CPP uses char and double versions of max(), the compiler will generate both versions in B.OBJ—even though a double version was already created in A.OBJ. The compiler has no way of knowing that a double version was already generated in A.OBJ.

Then, at the link step, all the duplicates are identified and eliminated. The advantage of Borland's default Smart option is that it's almost completely automatic.

The other option is to treat templates much like ordinary functions. In one file you instantiate all the templates that you'll need and instruct the compiler to generate public definitions for them (Global template option). In other files you instruct the compiler to generate external references to the template instances (External template option). For example, if you needed int and double versions of max() in more than one file, you'd use the Global template option in one file and the External template option in the other files (see Figure 5).

This approach requires more work than the Smart method, since you must think out what versions of each template you need. Also, you must make sure that the definitions appear in only one place or you'll get linkage failures. On the other hand, this method offers more control, because it lets you limit the valid types for each template. For example, perhaps you don't want to use max() to compare doubles. If you unwittingly do so somewhere in your code, you'll get a linkage failure.

A TEMPLATE FOR SUCCESS Templates are an emerging but important aspect of C++ technology. They help you create groups of types for which the basics are all the same but the details differ. Though a challenge to compiler vendors, they are a powerful convenience for C++ programmers. □

KAARE CHRISTIAN IS AUTHOR OF THE BOOK *BORLAND C++ TECHNIQUES AND UTILITIES*, AND DEVELOPS IMAGING SOFTWARE FOR NEUROSCIENTISTS.

HEADS, IT'S REAL. TAILS, IT'S FAKE.

It's your choice. A little more than 50 percent of all business software in use today is pirated. If you buy it, you could end up with virus-ridden, phony software that has no documentation or product support.

Selling or copying pirated software without authorization is against the law, with severe criminal and civil penalties including imprisonment of up to five years, fines of up to $250,000, or both. If you suspect the sale or use of pirated software, call the BSA Anti-Piracy hotline:

(800) 688-BSA1 (2721)

Business Software Alliance

© 1993 Business Software Alliance. All rights reserved.

Utilities

BY BOB FLANDERS AND MICHAEL HOLMES

Spy on DOS Programs with INFORMER

In the early days of personal computing, when operating systems had only a few dozen functions, it was fairly easy to determine exactly how a program used the operating system to perform a given task. But today, even DOS—the simplest of the Intel-based operating systems—has become much more complicated. Undocumented functions, support for extended and expanded memory, and TSRs are all routinely used by today's DOS programs.

INFORMER, a utility first published in *PC Magazine C Lab Notes* (Ziff-Davis Press, 1993), lets you spy on DOS programs to see how they work. By intercepting the interrupts used to request services from DOS, the BIOS, and other support programs (such as EMM-386.SYS), INFORMER is able to report the services a program uses as well as how often it calls them. INFORMER monitors the program you specify and gives insight into how it works.

You can obtain the INFORMER program and its source code by downloading the file INFORM.ZIP from the Utilities/Tips Forum on PC MagNet. For details on how to download files or get them by mail, see the sidebar "Guide to Our Utilities & How to Get Them." To compile INFORMER, you will need the Borland or Microsoft C compiler.

USING INFORMER INFORMER is very easy to use. It requires no special installation; simply copy INFORMER.EXE to your hard disk. Then at the command prompt, type INFORMER followed by the command for executing the program you wish to monitor. For example, to monitor the operation of the CHKDSK program, enter

```
INFORMER CHKDSK
```

(If you invoke INFORMER without specifying a program to execute, you are presented with a short help message.) First, INFORMER displays its copyright notice. Following that, it runs the CHKDSK program, and CHKDSK then displays its normal report. INFORMER's report then follows, showing the statistics gathered during CHKDSK's execution. Figure 1 is an example of the report produced by INFORMER after monitoring CHKDSK's execution.

Top 10 Windows Utilities

Rank	Utility
1	**INCTRL** - *Installation control*
2	**CLIPST** - *Extends the clipboard*
3	**CHANGER**- *Changes look of desktop*
4	**WINCMD** - *Command file interpreter*
5	**RCLICK** - *Puts menu bars at cursor*
6	**FNTPRN** - *Catalogs your fonts*
7	**WINTIDY** - *Organizes program manager*
8	**BUGS** - *Windows 3.1 screen saver*
9	**WPRINT** - *Prints in Windows 3.1*
10	**WTIME** - *Keeps PC clock accurate*

This list is based on the total number of downloads each utility has had on PC MagNet over the past 12 months. To download these files, type GO ZNT:TIPS. For more information, see the sidebar "How to get PC Magazine's Utilities."

INFORMER's full syntax is

```
INFORMER [/output] program [options]
```

The *output* argument specifies the filename where INFORMER is to write its report. If you do not specify the *output* argument, INFORMER writes its report to the standard output device (usually the screen). If specified, however, the *output* argument must be the first argument on the command line and must be preceded by a slash. For example, this command tells INFORMER to monitor CHKDSK and to send INFORMER's report to the printer:

```
INFORMER /PRN CHKDSK
```

You should note that using DOS redirection will capture both INFORMER's output and the program's output, as explained later in this section.

The *program* argument tells INFORMER which program to execute and monitor. The *program* argument must specify the filename of a .COM or .EXE file. You do not need to specify the extension, though you can if necessary to differentiate between .COM and .EXE files with the same name. The file must exist and must be located in the current directory or in a directory referenced by the PATH environment variable.

Command line arguments for the program being monitored must appear after the *program* argument on the command line. For example, to monitor CHKDSK and specify CHKDSK's /F option, you'd use the command

```
INFORMER CHKDSK /F
```

An alternative to specifying the *output* argument is to redirect standard output. For example, to monitor CHKDSK and redirect both CHKDSK's and INFORMER's output to the printer, use the command

```
INFORMER CHKDSK >PRN
```

If you do this, you will capture the monitored program's output as well as INFORMER's report.

Although INFORMER can monitor the execution of DOS external com-

INFORMER Output for CHKDSK

```
INFORMER 1.1 ■ Copyright (c) 1992-1994, Bob Flanders and Michael Holmes
Version 1.0 published in PC Magazine C Labnotes, ZD Press, 1992
Version 1.1 published in PC Magazine, January 25, 1994


Volume DDRIVE    created 12-16-1991 6:58p
Volume Serial Number is 264C-1A01

  71059456 bytes total disk space
     75776 bytes in 3 hidden files
     75776 bytes in 33 directories
  20453376 bytes in 731 user files
  50454528 bytes available on disk

      2048 bytes in each allocation unit
     34697 total allocation units on disk
     24636 available allocation units on disk

    655360 total bytes memory
    387760 bytes free

--------------- Informer Statistics ---------------
    Command Line: chkdsk
      Started at: 19:46:41 on 05/18/1992
    Completed at: 19:46:43
    Elapsed Time:  0:00:01.59
Termination Code: 0

Interrupt Usage
    1027 Int 21 - DOS interrupt
       2 Int 25 - Disk read interrupt

Int 21 (DOS) Breakdown by Function
       2 Fnc 0D - Disk reset
       3 Fnc 0E - Select disk
      35 Fnc 11 - Search first using fcb
     834 Fnc 12 - Search next using fcb
       2 Fnc 19 - Get default disk number
       2 Fnc 1A - Set disk transfer area
       2 Fnc 25 - Set interrupt vector
       1 Fnc 30 - Get DOS version
       1 Fnc 32 - Get drive parameter block
       2 Fnc 35 - Get interrupt vector
       1 Fnc 36 - Get disk space
       2 Fnc 38 - Get/set country information
      68 Fnc 3B - Change current directory
      52 Fnc 40 - Write to file with handle
       9 Fnc 4E - [illegible]
       1 Fnc 47 - Get current directory
       2 Fnc 48 - Allocate memory
       1 Fnc 4A - Adjust memory block size
       1 Fnc 4C - Quit with exit code
       1 Fnc 52 - Get list of lists
       2 Fnc 60 - Resolve path string
       1 Fnc 62 - Get psp address
       1 Fnc 63 - 2-byte character support
       1 Fnc 68 - Commit file

Usage by Classification
    1006 - Disk Calls
       3 - Memory Management Calls
      20 - Operating System Calls

Input/Output Byte Counts
    read  written
       0      453 - File
```

Figure 1: **This sample of INFORMER output was obtained through redirection, so you can see the output of CHKDSK along with INFORMER's report.**

mands (such as CHKDSK.EXE), internal commands such as DIR and ERASE are part of COMMAND.COM and cannot be directly monitored by INFORMER. If you attempt to monitor an internal command in the usual way, you'll get an error message telling you that the requested program was not found. However, you *can* monitor internal DOS commands by loading another copy of COMMAND.COM. For example, you can monitor the DIR command by typing

```
INFORMER COMMAND /C DIR
```

but some of the reported calls will result from loading the second copy of COMMAND.COM. To remove this overhead, you can type

```
INFORMER COMMAND /C
```

and then subtract the results from the DIR command statistics.

There's only one caveat in the use of INFORMER, and that has to do with TSRs. INFORMER monitors a program by intercepting certain interrupts, counting the number of times the monitored program issues those interrupts, and restoring the interrupt vector to its original value. Most TSRs also intercept one or more interrupts before terminating but in most cases don't restore them until the TSR is removed from memory. If you were to monitor a program that terminated after changing an interrupt used by INFORMER, the TSR might malfunction after INFORMER restores the original value of that interrupt vector, resulting in unpredictable side effects.

For example, one of the interrupts monitored by INFORMER is the BIOS serial communications support interrupt 14h. If you monitor a TSR that also intercepts INT 14h, when the TSR terminates (and stays resident), INFORMER will restore the original value of the interrupt vector, and the TSR will no longer have control of INT 14h. Furthermore, should the TSR subsequently be removed from memory, the 14h interrupt vector will probably be restored to the value found when the TSR started. Since the vector was set to execute INFORMER's routine, and INFORMER is no longer in memory, INT 14h will no longer point to a valid interrupt handler and will probably crash the system when invoked.

INFORMER can't get around this problem, but it can warn you of it. If INFORMER detects that a program has changed one of the interrupt vectors set by INFORMER, it will issue a message that you should reboot your system.

INFORMER'S REPORT As shown in Figure 1, INFORMER displays its report after the monitored program finishes running. The report has five sections: Summary Information, Interrupt Usage, Breakdown by Function, Usage by Classification, and Input/Output Byte Counts.

The Summary section shows some general statistics about the monitored program. This section includes the monitored program's command line, the time and date the program started and completed, the length of time it ran, and its termination code. (If a program starts and stops on the same day, no date is displayed on the "Completed at" line.)

The Interrupt Usage section comes next and shows the number of times that the monitored program invoked specific interrupts. INFORMER monitors the following nine interrupts:

- Timer hardware (INT 08h)
- Video BIOS (INT 10h)
- BIOS serial support (INT 14h)
- BIOS keyboard support (INT 16h)
- BIOS printer support (INT 17h)
- DOS functions (INT 21h)
- Absolute sector reads (INT 25h)
- Absolute sector writes (INT 26h)
- EMS support (INT 67h)

Of these nine, all but the timer interrupt may appear in the Interrupt Usage section of the report. The number of timer interrupts is shown indirectly, via the elapsed time information in the summary section.

INFORMER Output After an ASSIGN

```
C:\>assign a=c

C:\>informer chkdsk a:

INFORMER 1.1 ■ Copyright (c) 1992-1994, Bob Flanders and Michael Holmes
Version 1.0 published in PC Magazine C Lab Notes, ZD Press, 1992
Version 1.1 published in PC Magazine, January 25, 1994

Cannot CHKDSK a SUBSTed or ASSIGNed drive

--------------- Informer Statistics ---------------
    Command Line: chkdsk a:
      Started at: 22:32:23 on 10/31/1993
    Completed at: 22:32:25
    Elapsed Time:  0:00:01.64
Termination Code: 0

Interrupt Usage
      41 Int 10 - Video interrupt
      90 Int 16 - Keyboard interrupt
      21 Int 21 - DOS interrupt
       1 Int 25 - Disk read interrupt

Int 21 (DOS) Breakdown by Function
       1 Fnc 0D - Disk reset
       1 Fnc 19 - Get default disk number
       1 Fnc 30 - Get DOS version
       1 Fnc 36 - Get disk space
       1 Fnc 40 - Write to file with handle
       8 Fnc 44 - IOCTL
       1 Fnc 4A - Adjust memory block size
       1 Fnc 4C - Quit with exit code
       1 Fnc 52 - Get list of lists
       2 Fnc 60 - Resolve path string
       1 Fnc 62 - Get PSP address
       2 Fnc 63 - 2-byte character support

Usage by Classification
      90 - Console Calls
      11 - Disk Calls
      41 - Video Calls
       1 - Memory Management Calls
      10 - Operating System Calls

Input/Output Byte Counts
    read  written
       0       41 - Video
       0       41 - File
```

Figure 2: **You can't use ASSIGN to flip drive letters and then run CHKDSK. INFORMER gives clues as to how CHKDSK determines that ASSIGN has been used.**

INFORMER's Structures

```
struct                                  /* interrupt list          */
    {
    int  int_nbr;                       /* interrupt number        */
    char int_itype,                     /* interrupt type          */
         *int_text;                     /* description             */
    void (interrupt far *int_new)(),    /* new routine address     */
         (interrupt far *int_old)(void); /* old int address        */
    long int_cnt;                       /* int usage count         */
    } int_list[] =
        { { 0x08, INT_NONE, "Timer",       int08_new },
          { 0x10, INT_VID,  "Video",       int10_new },
          { 0x14, INT_COMM, "Serial I/O",  int14_new },
          { 0x16, INT_CON,  "Keyboard",    int16_new },
          { 0x17, INT_PRT,  "Printer",     int17_new },
          { 0x67, INT_MEM,  "EMS",         int67_new },
          { 0x21, INT_NONE, "DOS",         int21_new },
          { 0x25, INT_DISK, "Disk read",   int25_new },
          { 0x26, INT_DISK, "Disk write",  int26_new }
        };
struct                                  /* usage by classification */
    {
    long int_tcnt;                      /* count for this int type */
    char *int_tdes;                     /* description             */
    } int_type[] =
        { { 0, "Console Calls" },
          { 0, "Disk Calls" },
          { 0, "Printer Calls" },
          { 0, "Video Calls" },
          { 0, "Memory Management Calls" },
          { 0, "Serial Communications" },
          { 0, "Operating System Calls" }
        };
struct                                  /* i/o byte counts         */
    {
    char *io_desc;                      /* description             */
    long io_read,                       /* bytes read              */
         io_write;                      /* bytes written           */
    } io_cnt[] =
        { { "Keyboard" },
          { "Video" },
          { "Serial" },
          { "Printer" },
          { "File" }
        };

long    int21_cnt[256];                 /* DOS subfunction counts  */
struct                                  /* int 21 subfunctions     */
    {
    char int21_type;                    /* type of function        */
    char *int21_text;                   /* description of function */
    } int21_list[] =
        { { INT_DOS,  "Program termination" },
          { INT_CON,  "Keyboard input" },
          { INT_VID,  "Display output" },
            .
            . One entry per DOS function
            .
        };
```

Figure 3: **INFORMER's structures store which interrupts to intercept (int_list[]), how interrupts are categorized (int_type[]), the number of bytes read and written (io_cnt[]), and the description and number of calls to INT 21h DOS functions (int21_list[] and int21_cnt[]).**

The Interrupt Usage section tells you which interrupts are most heavily used by a program, and which are not used at all. Sometimes you may be surprised by what you find. For example, you may notice that there are no video interrupts recorded in Figure 1 and wonder how CHKDSK gets its report to the screen. In this case, the output was redirected to a file with the command

```
INFORMER CHKDSK >INFORMER.RPT
```

Since all screen output was sent to a file, no video interrupts were issued. INFORMER only reports on interrupts that have a nonzero count.

The Int 21 (DOS) Breakdown by Function section shows the number of calls to individual DOS functions. For example, in Figure 1, DOS function 4Ch (quit with exit code) is invoked once. You may find the DOS function breakdown section of particular interest when you are trying to determine how a program performs some function.

Now let's use INFORMER to discover some secrets of undocumented DOS functions. Let's say you use the DOS ASSIGN command to redirect requests for drive A: to drive C:, then you attempt to execute the command CHKDSK A:. CHKDSK will respond with an error message indicating that it cannot check an ASSIGNed drive. But how does it know the drive is ASSIGNed when there is no documented DOS function for determining this?

Figure 2 shows INFORMER's output after monitoring the execution of CHKDSK on an ASSIGNed disk. The DOS function breakdown section provides a clue. As shown, CHKDSK issued several DOS calls, most of which are well documented but do not provide the information needed to determine if a drive is ASSIGNed. CHKDSK also issues three DOS calls that are not documented: Get list of lists (52h), Resolve path string (60h), and 2-byte character support (63h). It turns out that Resolve path

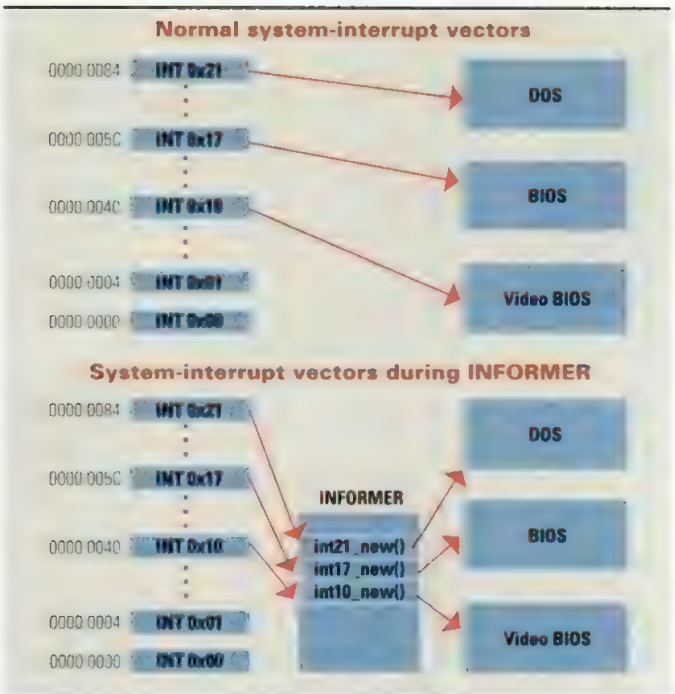


Figure 4: **INFORMER intercepts interrupts before passing them to the system.**

string (60h) can be used to determine the true name of an ASSIGNed drive. As you can see, although INFORMER doesn't provide all of the answers about how a program works, it can provide hints that let you infer how a task is accomplished.

The Usage by Classification section summarizes the types of services requested and the resources used by the monitored program. As INFORMER gathers statistics, it places the requests in one of seven call classifications: console, disk, printer, video, memory management, serial communications, and operating system.

As implemented, INFORMER classifies all file I/O (both FCB-based and handle-based) as disk calls, even if the FCB or handle references a device such as the serial port or video. However, when the underlying device driver issues the BIOS calls, INFORMER classifies the resulting statistics properly. For example, if a program writes 50 bytes to the standard output device, and standard output is not redirected, the Usage by Classification section will record 1 disk call and 50 video calls, even though no disk I/O occurred.

The Input/Output Byte Counts section summarizes the number of characters read or written to various files or devices. This section tracks five categories: keyboard, video, serial, printer, and file. For each category but the keyboard and the printer, INFORMER maintains a count of bytes read and written. INFORMER maintains the count only of bytes read for the keyboard, and only of bytes written for the printer. If the count is zero, it is not reported.

Once again, the numbers shown in this section may surprise you. For example, if you monitored a program that wrote a 25-byte message to standard output, the I/O byte counts would reflect 25 bytes written both to a file and to video. This is clearly demonstrated in Figure 2. In this case, CHKDSK only performed file I/O when it wrote the message "Cannot CHKDSK a SUBSTed or ASSIGNed drive" to standard output. The Input/Output Byte Counts section reflects the 41 bytes contained in the message as both file I/O and video I/O.

INSIDE INFORMER When loaded, INFORMER displays its copyright message and verifies the command line arguments. INFORMER starts by checking if you have explicitly requested help with the /? option. If so, the program displays the help message and returns to DOS. Otherwise, INFORMER determines whether you have requested that the report be sent to a file, and if you have, INFORMER captures the specified filename. INFORMER checks the filename for validity while parsing the command line arguments. If the filename is invalid, INFORMER issues an error message and returns to DOS.

Finally, INFORMER builds the argument list that will be passed to the monitored program. The argument list is an array of string pointers, each pointing to a single argument from the command line. While building the argument list, INFORMER also recreates the command line string by reassembling it with one space between each argument. This string is later displayed in the Summary section of INFORMER's report. Because INFORMER must dismantle and rebuild the command line, errors can be introduced if the monitored program relies on receiving the command line exactly as entered.

INFORMER'S STRUCTURES INFORMER gathers statistics into four global structure arrays (see the code listing shown in Figure 3). The int_list[] array contains an entry for each interrupt that is intercepted and contains six members: interrupt number, interrupt type, a pointer to the name of the interrupt, a pointer to the new interrupt handler, a

install_handlers()

```
/* ************************************************************** *
 *      install_handlers() -- install interrupt handlers          *
 * ************************************************************** */
void    install_handlers(void)
{
int     i;                                  /* loop control          */

for (i = 0; i < INT_LIST; i++)              /* for each interrupt    */
    {
    int_list[i].int_old = _dos_getvect(     /* get old interrupt ..  */
                    int_list[i].int_nbr);   /* ..vector address      */

    _dos_setvect(int_list[i].int_nbr,       /* install new ..        */
                    int_list[i].int_new);   /* ..interrupt handler   */
    }

_dos_getdate(&start_d);                     /* get start date..      */
_dos_gettime(&start_t);                     /* ..and start time      */
}
```

Figure 5: **INFORMER prepares to intercept interrupts by calling install_handlers(), which saves the original interrupt vector addresses and replaces them with INFORMER routine addresses.**

int10_new()

```
/* ******************************************************************** *
 *      int10_new() -- video interrupt                                  *
 * ******************************************************************** */
void    interrupt int10_new(INT_PARMS)
{
switch (ax >> 8)                            /* based on function code   */
    {
                                            /* read functions           */
    case 0x08:                              /* character & attributes   */
    case 0x0d:                              /* pixel                    */
        io_cnt[IO_VID].io_read++;           /* bump read byte count     */
        break;                              /* ..and continue           */

                                            /* write functions          */
    case 0x09:                              /* character & attribute    */
    case 0x0a:                              /* character only           */
    case 0x0c:                              /* pixel                    */
    case 0x0e:                              /* tty mode                 */
        io_cnt[IO_VID].io_write++;          /* bump write byte count    */
        break;                              /* ..and continue           */

    case 0x13:                              /* write string             */
        io_cnt[IO_VID].io_write += cx;      /* add characters written   */
    }

int_list[INT_10].int_cnt++;                 /* tally video int requests */
_chain_intr(*int_list[INT_10].int_old);     /* jump to old int handler  */
}
```

Figure 6: **The routine int10_new() is INFORMER's replacement handler for INT 10h. It increments some counters and then transfers control to the original INT 10h handler.**

pointer to the old interrupt handler, and a count variable. INFORMER uses this array to install and remove the interrupt handler and to gather the interrupt usage statistics.

The int_type[] array has an entry for each class listed in the Usage by Classification section of INFORMER's report. There are only two members in this structure: the count variable and the description.

The io_cnt[] array contains an entry for each type of I/O statistic gathered. The three members of this structure are a pointer to a description, the input byte count, and the output byte count.

Finally, int21_cnt[] contains an entry for each of the 256 possible function codes passed in the AH register when DOS is called. Associated with int21_cnt[] is the int21_list[] array, which has an entry for every currently known DOS call. This array describes only the actual DOS functions. The structure has two entries: the type of function and the associated text. Each int21_list[] entry corresponds with one of the entries in the int21_cnt[] array.

INTERCEPTING THE INTERRUPTS As mentioned earlier, INFORMER gathers statistics by intercepting specific interrupts and counting the number of times the monitored program invokes those interrupts. Almost all programs request services from other software. A program may request DOS services, BIOS services, or other system software such as memory managers. In the majority of cases, these services are requested by invoking an interrupt.

At location 0:0 in memory, there is a table of 256 32-bit entries, known as the interrupt vector table. Each vector location may contain a far address pointer to a routine that gets control when the associated interrupt is issued. Most of these interrupts have predefined meanings in the DOS environment.

Figure 4 depicts the interrupt vector table as it exists normally and when INFORMER is executing. In the first illustration, the interrupt vectors point directly to the associated routines in the BIOS and DOS; however, when INFORMER runs, it changes those interrupt vectors, causing them to reference code within INFORMER. When the monitored program invokes an interrupt, it unknowingly passes control to INFORMER's interrupt handler. After INFORMER's interrupt handler has completed processing, it passes control to the original interrupt handler so the function requested by the monitored program is completed.

INFORMER calls install_handlers() to modify the required interrupt vectors (see Figure 5). For each entry in the int_list[] array, install_handlers() saves the value found in the interrupt vector referenced by the entry and installs a pointer to the corresponding INFORMER routine. After all of the interrupts have been intercepted, install_handlers() retrieves the current date and time.

LET THE EXECUTION BEGIN Having installed its interrupt handlers, INFORMER is ready to run the monitored program. INFORMER does this by calling the C library routine spawnvp(). The spawnvp() function requires the name of the program to execute as well as a pointer to the list of pointers to the command line arguments.

The spawnvp() function searches the current directory and then the directories named in the PATH environment variable to find the program to execute. Then spawnvp() loads the program into memory and passes control to it. When the program finishes, control is returned to INFORMER.

There are two other library functions—the exec. . .() family of functions and the system() function—that may seem appropriate for executing another program, but each has a drawback not shared by the spawn. . .() family. The system() function executes another program but does so by first executing another copy of COMMAND.COM. Using the system() function would thus return statistics not only for the target program but also for COMMAND.COM. The exec. . . () functions aren't suitable because they *replace* the calling program with the child program rather than returning to the calling program when the child program is done.

During the execution of the monitored program, INFORMER is taking up memory and its routines are being executed, but it is the monitored program that has control of the system. In effect, the monitored program is informing on itself!

Each time the monitored program invokes one of the interrupts monitored by

INFORMER, the associated interrupt service routine increments one or more counters before passing control to the original interrupt handler. For example, each time video interrupt 10h is issued, int10_new() gets control and adds one to the count of times the interrupt has been invoked (see Figure 6). Also, int10_new() checks the function code passed in the AH register. If the code requests a read from or write to the video buffer, the associated video I/O count is incremented. These values are subsequently reported in the Input/Output Byte Counts section.

The most complicated interrupt that INFORMER intercepts is interrupt 21h, through which a program issues requests to DOS. To add to the complexity, since INFORMER itself calls INT 21h, INFORMER must arrange to omit its own calls from the statistics. INFORMER prevents its own calls from skewing the results by enabling the collecting of statistics when a program to be monitored is loaded, and disabling the collecting of statistics immediately after the called program finishes executing.

Once INFORMER's replacement handler int21_new() is installed, all calls to INT 21h go through it. The calls could be from INFORMER, the monitored program, or even from a TSR. The int21_new() routine checks to see if the collection of statistics is enabled and increments the appropriate counters if it is. Since calls from TSRs will affect the statistics, it is best to run INFORMER on a clean system with the minimum number of TSRs loaded. After the statistics have been collected, int21_new() passes control to the old interrupt handler via the _chain_intr() function.

INTERRUPT HANDLERS IN C There are limitations to writing interrupt handlers entirely in C. One problem is that INFORMER can sometimes interfere with a program's ability to detect EMS (Expanded Memory Specification) memory. Some programs determine whether EMS memory is installed by opening the guaranteed device name EMMXXXX0. This will work fine using an interrupt handler written entirely in C. Other programs look for the string "EMMXXXX0" 10 bytes from the entry point of the handler pointed to by INT 67h. When INFORMER replaces the INT 67h handler with its own handler, this string is no longer present at the specified offset. Programs that try to detect EMS memory in this manner will fail to find it when run by INFORMER.

Another difficulty in writing an interrupt handler in C is that all of your processing must occur *before* you chain to the lower level handler. This is because the routine used in C to do this—_chain_intr()—returns directly to the code that invoked the C interrupt handler rather than to INFORMER's interrupt handler. You can get around this easily by using in-line assembly code, but then you are responsible for restoring registers and other details that _chain_intr() handles automatically.

remove_handlers()

```
/* ******************************************************************** *
 *      remove_handlers() -- remove interrupt handlers                  *
 * ******************************************************************** */
void    remove_handlers(void)
{
int     i;                                  /* loop control             */

enabled = 0;                                /* stop collecting data     */

_dos_getdate(&end_d);                       /* get ending date..        */
_dos_gettime(&end_t);                       /* ..and time               */

int21_cnt[0x4d]--;                          /* back out "get rc" call   */
int_list[INT_21].int_cnt--;                 /* ..from int 21 counts     */

for (i = 0; i < INT_LIST; i++)              /* for each interrupt       */
    _dos_setvect(int_list[i].int_nbr,       /* restore old ..           */
                 int_list[i].int_old);      /* ..interrupt handler      */
}
```

Figure 7: **When INFORMER is finished running, it restores the interrupt vectors to their original values by calling remove_handlers().**

AFTER EXECUTING THE PROGRAM Immediately after the monitored program finishes executing, INFORMER calls remove_handlers() to restore the original values to the interrupt vectors (see Figure 7). The remove_handlers() routine disables statistics collection and retrieves the date and time for INFORMER's report. Then spawnvp() calls DOS function 4Dh to get the return code of the executed program. INFORMER decrements the count for this function and for INT 21h in general, since the call was not made by the child program. Finally, remove_handlers() restores the interrupt vectors saved in the int_list[] array.

INFORMER's last action is to display the results of the statistics that have been gathered. During this phase, INFORMER checks to see whether spawnvp() was successful in finding the program requested. If not, an error message is displayed and INFORMER returns to DOS. Otherwise, INFORMER attempts to open the report file if the user specified one on the command line. If no filename was specified or if the open attempt fails, INFORMER sends the output file to standard output.

The most complicated interrupt that INFORMER intercepts is interrupt 21h.

INFORMER produces the report by simply printing the information contained in the structures shown in Figure 3. However, there are a few interesting details. INFORMER computes the elapsed time based on the number of times the timer interrupt 08h was called. Unlike the other interrupts monitored by INFORMER, the timer interrupt is a hardware interrupt and is invoked 18.2 times per second. INFORMER converts the number of timer interrupt ticks to hundredths of a second and subsequently uses this information for its Elapsed Time statistic.

As mentioned earlier, certain DOS functions are also credited to various

entries in the Usage by Classification section. However, the collecting of these statistics is not done when the monitored program calls DOS. To avoid additional overhead during the monitored program's execution, INFORMER classifies DOS functions as it prints the Breakdown by Function section. As it checks each entry in the int21_cnt[] array, INFORMER adds that entry to the appropriate int_type[]. The results are in the Usage by Classification section of the report. Only nonzero statistics are printed.

INFORMER gives you insight into how DOS programs work—by monitoring their execution and collecting statistics on how they interact with the operating system. It also provides a model of how to intercept and process interrupts, chain to existing interrupt handlers, and execute and monitor other programs. Several utilities let you spy on Windows programs; with INFORMER you can spy on DOS programs too. □

BOB FLANDERS AND MICHAEL HOLMES ARE PRESIDENT AND VICE PRESIDENT OF NCI SYSTEMS AND COAUTHORS OF THE BOOKS *PC MAGAZINE C LAB NOTES* AND *C COMMUNICATIONS UTILITIES*.

GUIDE TO OUR UTILITIES & HOW TO GET THEM

INFORMER

PURPOSE: Reports the exact interrupt services a program uses, as well as how often it calls them. INFORMER displays its report after the monitored program finishes running. The report has five sections: Summary Information, Interrupt Usage, Breakdown by Function, Usage by Classification, and Input/Output Byte Counts.

FORMAT: `INFORMER [/output] program [options]`

REMARKS: The *output* argument specifies the filename where INFORMER is to write its report. If you do not specify the *output* argument, INFORMER writes its report to the standard output device (usually the screen). If specified, however, the *output* argument must be the first argument on the command line. Using DOS redirection after the *program* argument, you can capture both INFORMER's output and the program's output.

The *program* argument tells INFORMER which program to execute and monitor. The *program* argument must specify the filename of a .COM or .EXE file. The file must exist and be located in the current directory or in a directory referenced by the PATH environment variable.

Command line arguments for the program being monitored must appear after the *program* argument on the command line.

Although INFORMER can monitor the execution of DOS external commands (such as CHKDSK.EXE), internal commands such as DIR and ERASE are a part of COMMAND.COM and cannot be directly monitored by INFORMER. If you attempt to monitor an internal command in the usual way, you'll get an error message telling you that the requested program was not found. However, you *can* monitor internal DOS commands by loading another copy of COMMAND.COM.

You cannot use INFORMER with TSRs, because it may intercept an interrupt that the TSR has already intercepted. If INFORMER detects that a program has changed one of the interrupt vectors set by INFORMER, it will issue a warning message that you should reboot your system.

PC Magazine's utilities are available by modem from PC MagNet, our on-line service. PC MagNet is part of ZiffNet, a group of on-line services from Ziff-Davis Publishing Company. ZiffNet is hosted by CompuServe Information Service.

THE FIRST TIME If you've never used ZiffNet, you'll need to find the access number nearest you. First, set your communications software to 7 data bits, even parity, no stop bits, and full duplex. Then dial 800-346-3247 with your modem. When the modem connects, press Enter. At the HOST NAME prompt, enter PHONES. Follow the menus and note the closest access number. Or dial 800-635-6225 (voice) and follow the instructions.

HOW TO JOIN ZIFFNET Dial the local access number. At the HOST NAME prompt, enter CIS. At the USER ID prompt, type 177000,5000. When you see the PASSWORD prompt, enter PC*MAGNET. Finally, when you see the ENTER AGREEMENT NUMBER prompt, enter PCMAG93. Current CompuServe members can type GO PCMAG at any CompuServe ! prompt. Once you enter your billing information, you'll see your personal user ID and temporary password.

MEMBERSHIP PRIVILEGES Membership costs $2.50 per month. As a ZiffNet member, you receive free access to *PC Magazine* Editors' Choice awards, Product Reviews Index, weekly news from *PC Week*, Buyer's Market, ZiffNet Highlights, the Support Forum, and the current utility (type GO ZNT:FREEUTIL). For other services, there is a connect-time charge of $12.80 per hour for 1,200 or 2,400 bps, or $22.80 per hour for 9,600 or 14,400 bps. Billing is based on 1-minute increments. You can also download all of *PC Magazine*'s utilities and tips. Just type GO ZNT:TIPS.

FREE UTILITY You can download this month's utility, free of charge, from *PC Magazine*'s BBS by dialing 617-231-4450 with your modem. Just enter your name at the prompt and follow the menus.

NO MODEM, NO PROBLEM If you don't have a modem, you can get our utilities by mail. Just send your request with your name, address, and preferred disk size to Public Brand Software, P.O. Box 51315, Indianapolis, IN 46251, fax, 317-856-2086.

COPYRIGHT INFORMATION The programs presented in *PC Magazine* can be copied but are copyrighted. You may make copies for others if no charge is involved, but making copies or using any portion for any commercial purpose is strictly prohibited.

PCSolutions

TIPS AND TECHNIQUES TO INCREASE YOUR PRODUCTIVITY

Peripherals

FINDING HIGH RESOLUTION DRIVERS

❓ I recently upgraded my display system from VGA to Super VGA. While I don't use Windows very much, I do draw lots of scientific diagrams in PostScript, which I view on screen using GoScript. I also do a lot of writing using PcTex and preview the pages with PcView.

My problem is that I can't seem to take advantage of this new high-resolution video card and monitor. After many telephone calls and much trial and error, I finally got PcView working at 800-by-600 resolution, but I still can't get the higher-resolution device drivers to work with my system. None of the Super VGA drivers for GoScript works at all, so I'm stuck working with VGA.

The card vendor told me that you can't use Super VGA under DOS. Is that true, and if so, why?

Thomas H. Barton
Calgary, Alberta, Canada

▶**PC MAGAZINE:** The vendor is guilty of oversimplification. You can indeed use resolutions beyond that of VGA with DOS applications, but it's not guaranteed to work in every case, and success doesn't always come easily.

The key to the problem is drivers. While Windows is the environment that some users love to hate, one fact is inescapable: Windows solves a lot of the hassles involved with high-resolution drivers. If you can successfully install a driver for your video card and get it running with Windows, it's likely to work for all Windows applications.

With DOS applications, however, things aren't so simple. Each application requires its own driver for a specific display adapter and different drivers for the various resolutions as well. There are many DOS programs that can take advantage of higher resolutions, but you typically have to rely on the board manufacturer to provide the drivers to make this work. These manufacturers often supply drivers for the more popular programs, such as Lotus 1-2-3 and AutoCAD, but more obscure programs may not be as widely supported.

The Video Electronics Standards Association (VESA) was created in part to address this problem. The association created standards for display adapters, including video-BIOS specifications, so that compatible cards could use the same drivers. Boards that conform to VESA standards may have the compatibility built into their BIOS or may rely on a TSR (terminate and stay resident) utility to provide compatibility. In either case, you can use a VESA driver for a given application with any compatible board.

It sounds as if your board is not VESA-compatible. If the board vendor can't supply drivers for your applications, you can contact the company that provides the video chip set used on the board (such as Tseng Laboratories, S3 Corp., or Weitek Corp., to name a few) to see if they have a driver for your program. Your only other option is to check with the software publisher.

—Alfred Poor

QUICKER COLOR PRINTING

❓ I print large quantities of color graphs and charts on a color ink-jet printer. Typically, I print 20 copies of a report containing 140 color charts. Since this is very time-consuming, I'd like to find a way to speed up the process. Do you have any ideas?

Debbie Paull
Gulfport, Michigan

▶**PC MAGAZINE:** It isn't clear which part needs to be faster—the time spent printing or the time the computer is tied up.

If the pages need to be produced more rapidly, there isn't much that can be done short of purchasing a faster printer. Depending on the resolution, it's quite possible that a color page printer could turn out the pages more quickly.

If you're concerned about tying up

SOLUTIONS INDEX

Peripherals
Finding High Resolution Drivers.....309
Quicker Color Printing.....309
Emulating an **Epson LQ** *Printer*.....312

Operating Environments
Editing Scripts with EDLIN.....312
Loading TSRs Inside a **Windows** *DOS Box*.....313

Word Processing
DOS Commands in **WordPerfect** *Macros*..314

Spreadsheets
Hiding Rows in **1-2-3 for Windows**.....320

Databases
Renaming Tables in **Paradox**.....322

Graphics
Incompatible Printer Emulations.....322

Languages
Access the **Windows** *Clipboard from DOS* **BASIC**.....322

PC DIRECT

PC DIRECT starts here with exciting offers from top direct vendors.

See index, page 313.

FINALLY, A SYSTEM WITH YOU'D ACTU

You get a big UltraScan™ 15FS Monitor.

Our Sound Studio Software has a CD and MIDI player, mixing panel, wave recorder and sound effects library.

A Multi-Session, Double-Spin CD ROM Drive is included.

You'll also find a Labtec Dynamic Microphone.

Software is pre-loaded. (Packaging not included.)

We've installed a VL #9GXE Video Card for face-warping video.

And a Sound Blaster 16-bit Audio Card, which makes for awesome sound on our...

Exclusive Peavey 200 Multimedia Speakers.

This Special Edition Aldus Photo Styler Software lets you retouch photos, create images and make composites and color separations.

THE DELL DIMENSION™ XPS 466V SYSTEM

$3,397

(other systems featured are not pictured)

PC Computing BEST

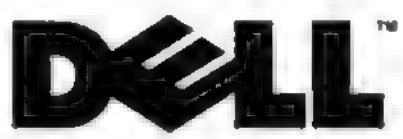
intel inside

†1993 J.D. Power and Associates Desktop Personal Computer Customer Satisfaction Study conducted among business users and based on 1,956 user respondents. ***Guarantees available in the 78759-7299. Attention Dimension Guarantees.** *Prices valid in U.S. only. Some products and promotions not available in Canada. †Business leasing arranged by Leasing Group, Inc. The Intel is a trademark of Microsoft Corporation. Dell disclaims proprietary interest in the marks and names of others. ©1994 Dell Computer Corporation. All rights reserved

MULTIMEDIA COMPONENTS ALLY WANT.

INTRODUCING THE DELL STATE-OF-THE-ART, FULLY-ASSEMBLED, MULTIMEDIA SYSTEM.

Let's face it. When you buy a fully-assembled, multimedia system you may have to compromise on component quality. To get the system you want, you could run all over town buying everything from the speakers to the CD drive. Not anymore. We did all the work for you. Basically, we hand-picked the best components. Then we engineered them into incredible systems. And we were ranked highest in customer satisfaction among business users by J.D. Power and Associates†. No wonder these are multimedia systems everyone seems to want.



TO ORDER, CALL

800-289-1460

HOURS: MON-FRI 7AM-9PM CT SAT 10AM-6PM CT SUN 12PM-5PM CT

IN CANADA*, CALL 800-668-3021. PLEASE REFERENCE **#11BKE**

Pictured System:

DELL DIMENSION XPS 466V i486™ DX2 66MHz SYSTEM

$3,397 **Business Lease◊: $125/MO.**

• 16MB RAM • 64MB Max RAM • 256KB External Cache • 450MB Hard Drive • Upgradeable to Pentium™ Overdrive™ • 5 16-Bit ISA Expansion Slots Available, 1 on VL-Bus™ • VL #9GXE Video Accelerator Card with Video Control Panel Software • 3MB Video RAM • UltraScan 15FS Monitor (15", 1024 x 768, .28mm, NI) • One Diskette Drive (3.5") • SpaceSaver Keyboard • Multi-Session, Double-Spin CD ROM Drive • Sound Blaster 16 Sound Card • Peavey Speakers • Microphone • MS-DOS® 6.0/Microsoft® Windows™ 3.1/ Mouse • Sound Effects Library • Special Edition Aldus Photo Styler • Microsoft Home Sampler

Order Code **#5000220**

DELL DIMENSION 433SV i486 SX 33MHz SYSTEM

$1,799 **Business Lease: $67/MO.**

• 4MB RAM • 64MB Max RAM • 170MB Hard Drive • Upgradeable to Pentium Overdrive • 4 16-Bit ISA Expansion Slots Available, 2 on VL-Bus • Accelerated Local Bus Video • SVGA 1024I Monitor (14", 1024 x 768, .28mm) • One Diskette Drive (3.5") • SpaceSaver Keyboard • Multi-Session, Double-Spin CD ROM Drive • 16-Bit Sound Card • Peavey Speakers • Microphone • MS-DOS 6.0/ Microsoft Windows 3.1/Mouse • Multimedia Microsoft Works • Microsoft Bookshelf • Quicken for Windows • Microsoft Encarta • Microsoft Home Sampler

Order Code **#5000221**

DELL DIMENSION XPS 450V i486 DX2 50MHZ SYSTEM

$2,799 **Business Lease: $104/MO.**

• 8MB RAM • 64MB Max RAM • 320MB Hard Drive • 256KB External Cache • Upgradeable to Pentium Overdrive • 5 16-Bit ISA Expansion Slots Available, 1 on VL-Bus • VL #9GXE Video Accelerator Card with Video Control Panel Software • 1MB Video RAM • UltraScan 15FS Monitor (15", 1024 x 768, .28mm, NI) • One Diskette Drive (3.5") • SpaceSaver Keyboard • Multi-Session, Double-Spin CD ROM Drive • Sound Blaster 16 Sound Card • Peavey Speakers • Microphone • MS-DOS 6.0/ Microsoft Windows 3.1/Mouse • Sound Effects Library • Special Edition Aldus Photo Styler • Microsoft Home Sampler

Order Code **#5000222**

DELL DIMENSION XPS P60 PENTIUM 60MHZ SYSTEM

$3,849 **Business Lease: $139/MO.**

• 16MB RAM • 128MB Max RAM • 528MB Hard Drive • 256KB External Cache • 5 Expansion Slots Available (3 16-Bit ISA, 1 PCI, 1 PCI/ISA Shared) • PCI #9GXE Video Accelerator Card with Video Control Panel Software • 1MB Video RAM • UltraScan 15FS Monitor (15", 1024 x 768, .28mm, NI) • One Diskette Drive (3.5") • SpaceSaver Keyboard • Multi-Session, Double-Spin CD ROM Drive • Sound Blaster 16 Sound Card • Peavey Speakers • Microphone • MS-DOS 6.0/ Microsoft Windows 3.1/Mouse

Order Code **#5000223**

USA only for registered owners of Dell Dimension systems purchased after 8/1/93. For a complete copy, please call our TechFax℠ line at 1-800-950-1329 or write Dell USA L.P., 9505 Arboretum Blvd., Austin, TX

Inside logo is a registered trademark and i486, Pentium and Overdrive are trademarks of Intel Corporation. VL-Bus is a trademark of Video Electronics Standards Association. MS-DOS and Microsoft are registered trademarks and Windows

your computer while these pages are printing, you should consider an external print buffer. The more sophisticated models can be set to produce a desired number of copies for each print job automatically. Print buffers also have expandable memory capacities, so you may be able to get more than one page into the buffer at one time. This will allow the printer to work from data sent by the buffer, leaving your PC unencumbered and able to devote its full attention to your work.—*Alfred Poor*

Our Advisors

Douglas Boling is a contributing editor and the author of many utilities, including M8OOT.COM and EMS40.SYS.
Frank J. Derfler, Jr., is senior networking editor and the author of the *PC Magazine Guide to Connectivity.*
Alfred Poor is a contributing editor and the author of *New Life for Old PCs.*
Jeff Prosise is a contributing editor and the author of the *PC Magazine Guide to DOS 5 Memory Management.*
Sal Ricciardi is a contributing editor and the author of the recent *Running FoxPro* books from Microsoft Press.
Neil Rubenking is technical editor and author of *Can Do DOS, Can Do Windows,* and *PC Magazine Batch File Lab Notes.*
Joe Salemi is a contributing editor and the author of the *PC Magazine Guide to Client/Server Databases.*
Luisa Simone is a contributing editor and the author of the book *Microsoft Publisher.*
Craig Stinson is a contributing editor and coauthor of *Running Windows 3.1* and *Running Microsoft Excel.*
M. David Stone is a contributing editor and coauthor of *Word for Windows Companion,* Second Edition.
Ethan Winer is a contributing editor and the author of *PC Magazine BASIC Techniques and Utilities.*

EMULATING AN EPSON LQ PRINTER

❓ I'm using a custom-developed application that produces reports for the Epson LQ-850 printer, but I have an HP LaserJet IIIP and the reports are coming out garbled. Do you know of a small utility that will allow an HP LaserJet to emulate an Epson LQ printer?

Cameron Dalsto
Toronto, Ontario, Canada

▶**PC MAGAZINE:** There are software solutions to this problem, such as LaserJet Printing Utilities from Dynacomp (800-828-6772, 716-265-4040) and Laser-Control, Version 3.4, from Insight Development Corp. (800-825-4115), but there's an even simpler hardware solution. Hewlett-Packard Co. makes an Epson emulation cartridge that works with the LaserJet IIIP and provides Epson FX-80 emulation. This cartridge uses a subset of the LQ-850 commands but should work for text-based reports. The best part is that it doesn't require any system memory, which obviously wouldn't be the case with a software solution.
—*Alfred Poor*

HOW TO CONTACT US

Do you have a hardware, software, or systems problem you can't solve? Do you have a tip you think other readers could use? Or maybe you'd like a better understanding of how something works. If so, we invite you to let us know about it. Our experts can give you practical solutions to your problems, provide techniques for using your software and hardware more productively, and help you grasp computer concepts and understand the latest technology.

It's easy to contact us. Just send us your submission (use ASCII format for text files) via the medium that's most convenient for you:

U.S. Mail: Solutions, *PC Magazine,* One Park Ave., New York, NY 10016-5802. (Please send a floppy disk along with a printout.)
Fax: 212-503-5799.
MCI Mail: Solutions, 556-3896.
CompuServe Mail: 72241,104.
PC MagNet: Select Submissions to PC Magazine from the main PC MagNet menu. Upload your file to the most appropriate library. If at any time you need help, simply type a question mark (?) and hit Enter; a list of commands will be displayed. If you are not already a member of PC MagNet but would like to join, follow the instructions on page 12 to find your local access number.
CompuServe Members: If you're a CompuServe member, you can join PC MagNet by typing GO PCMAG at any CIS prompt.

For any tip we print, you'll receive $50 plus a *PC Magazine* T-shirt. We regret that we cannot answer letters individually.

Operating Environments

EDITING SCRIPTS WITH EDLIN

❓ Your columns often discuss controlling EDLIN with a script created *using* EDLIN. Since script lines are commands and not text, though, how can they be manipulated with EDLIN? I've been able to find no EDLIN reference that even mentions scripts. I did manage to write a script using *PC Magazine*'s TED utility and wondered if I could use DOS 5.0's EDIT for the same purpose.

Al Hershey
Syosset, New York

▶**PC MAGAZINE:** EDLIN is an incredibly antiquated text editor—it's not even included with DOS 6.0. The *only* good reason to use EDLIN these days is its ability to work with input redirection, which lets you control it from a script. You create an EDLIN script by storing a list of EDLIN commands (typed exactly as you would have issued them during an editing session) in a file. You use the script by redirecting it into EDLIN with the input redirection character <.

Suppose, for example, you frequently need to change every occurrence of "cat" in your files to "dog". An EDLIN script that makes the change looks like this

```
1Rcat^Zdog
E
```

The first line performs the replacement, the second saves the file and exits EDLIN. (That second line is essential,

since leaving EDLIN is the only way to return input control to the keyboard—a script that doesn't end with a command to exit EDLIN will hang your system.) If you name the script CAT2DOG.SCR, you'd process a file called PETS.DAT with the command

```
EDLIN PETS.DAT < CAT2DOG.SCR
```

Here's how to create the script *using* EDLIN. Enter `EDLIN CAT2DOG.SCR` and at the asterisk prompt enter `1i` to start inserting lines. At the `1:*` prompt, type `1Rcat`, press Ctrl-Z, type `dog`, and press Enter. Enter `E` on the second line, then press Ctrl-C on the third line to stop inserting lines. At the asterisk prompt, enter `E` to save the script file and exit.

As you point out, you certainly are working with commands—but while *you* know that, EDLIN doesn't. Only the way *you* use this particular text makes it function as a series of commands. So can you create EDLIN scripts using EDLIN? No problem!

But what happens when you try to edit the existing script file? Since ^Z is the end-of-file character, EDLIN stops loading the file when it hits the one in the middle of the first line—all you get is "1Rcat". If you want EDLIN to load a file that contains ^Z characters, you have to put a /B switch on the EDLIN command line (for example, `EDLIN /B CAT2DOG.SCR`) telling EDLIN to load the whole file, even if it contains ^Z characters.

Yes, you can also use DOS 5.0's EDIT to create and edit EDLIN scripts, and no special command line switch is required to load files containing the ^Z character. But to *insert* that character into the file you're editing, you have to press Ctrl-P, then Ctrl-Z.—*Neil J. Rubenking*

LOADING TSRs INSIDE A WINDOWS DOS BOX

TIP Since the advent of Windows 3.1, I rarely use DOS, so it seemed wasteful to keep loading DOS-specific drivers and TSRs, such as ANSI.SYS and DOSKEY.COM, in my CONFIG.SYS and AUTOEXEC.BAT files. But on those occasions when I *want* to use DOS, it's irritating to have to reload all the TSRs and impossible to load ANSI.SYS without rebooting, since ANSI.SYS loads in CONFIG.SYS.

First, I tried to open a Windows DOS session that included my TSRs by running a .PIF file to load a batch file that would execute the TSRs. But the only result was frustration since the DOS session terminated after executing the batch file, and I never even got a `C:\>` prompt.

My solution was to run another copy of COMMAND.COM, which requires about 3K of memory, at the *end* of the batch file. To create a colorful DOS prompt without ANSI.SYS, I used the *PC Magazine* utility ANSI.COM. Figure 1 shows the .PIF file settings for my MSDOS.BAT batch file.

Charles P. Lusignan
Rochester, New York

▶PC MAGAZINE: If you spend most of your working time in Windows, it's true there's little point in loading your TSRs

SOFTWARE ▪ PERIPHERALS ▪ SYSTEMS ▪ COMPONENTS ▪ TOLL-FREE ▪ ADVICE

PC DIRECT

Premier Superstores
Top Direct Marketers
Manufacturers of
Systems, Software,
and Peripherals

If it's sold direct,
you'll find it here.

INDEX

SYSTEMS

AMS. 350
Comtrade 318
COMPUTER DISCOUNT WAREHOUSE 323
Dell Computer Systems....310
Expo Tech 332,342
Insight Distribution Network....333
Midwest Micro Peripherals....337
PCs Compleat....359
USA Flex....353

SOFTWARE/PERIPHERALS/COMPONENTS

American Small Business....363
Arlington Computer Products....330
Bulldog Computer Products....368
Computability....316
COMPUTER DISCOUNT WAREHOUSE....323
Dustin Discount Software 315
First Source International....348
Global Horizons, Inc....369
H. Co Memory Upgrades....358
Hi-Tech, USA....329
Kenosha Computer Center 352
LA Trade....364
Memory Direct 370
Megahaus 336
Micro Warehouse....371
Midwest Computer Works....366
Network Express 365
Pinnacle Micro....321
Valueline 351

SPEED ▪ SERVICE ▪ SUPPORT ▪ VALUE ▪ QUALITY

SOFTWARE ▪ PERIPHERALS ▪ SYSTEMS ▪ COMPONENTS ▪ TOLL-FREE ▪ ADVICE

PIF Settings

```
Program Filename:       C:\WINDOWS\MSDOS.BAT
Window Title:           MS-DOS
Optional Parameters:
Start-up Directory:     C:\

Video Memory:           Text
Memory Requirements:    128 required, -1 desired
EMS Memory              0 required, 0 limit
XMS Memory              0 required, 0 limit
Display Usage:          Windowed
Execution:              Background
```

Figure 1: **These are settings for the .PIF file that runs the MSDOS.BAT batch file.**

before Windows. Indeed, some TSRs—older screen savers in particular—have been reported to interfere with Windows. Loading the necessary TSRs from within a batch file associated with your DOS session means they're active *only* when a DOS session is active.

Windows runs a batch file by loading COMMAND.COM and telling *it* to run the batch file. Invoking yet another copy of COMMAND.COM does cost about 3K of RAM, but DOS 6.0 lets users avoid expending that RAM. The new /K switch causes COMMAND.COM to execute the command that follows and then remain loaded. It's similar to the older /C switch that causes COMMAND.COM to execute a command and then terminate.

To use the /K switch, eliminate the line at the end of your batch file that invokes the second copy of COMMAND.COM. Then in the PIF Editor, set the PIF's Program Filename to COMMAND.COM and set the optional parameters to /K MSDOS.BAT.

Note that this solution does not let you load device drivers that are needed only in DOS sessions; those still have to be loaded from CONFIG.SYS. Unlike OS/2, Windows does not allow a DOS session to have its own CONFIG.SYS.
—*Neil J. Rubenking*

Word Processing

DOS COMMANDS IN WORDPERFECT 5.1 MACROS

❓ My DOS system, which is connected to a UNIX network, uses a utility called LPR.EXE to send files to the network for printing. The specific command, typed at the DOS command line, is

```
LPR filename
```

Currently, I can use WordPerfect to print to a file, then send the file to the network printer by going to DOS and giving the LPR command. However, I'd rather avoid the extra step. Is there a way to send the print output directly to the utility program?

Eylon Shalev
Durham, North Carolina

▶**PC MAGAZINE:** Without a UNIX network and the LPR utility handy, it's impossible to provide a tested answer, but the technique that ought to work is straightforward. More important, it should be of interest to anyone who would like to run a DOS command line utility from within WordPerfect. And it should be of particular interest to those who would like to automate such commands.

Although WordPerfect won't let you send print output directly to your utility program, Version 5.1 can give you the same result through a different route. You only need to print to a file on disk, then use WordPerfect's DOS Command feature to run the utility. This still requires the extra step, but you can automate it with a macro. (Note that Version 5.0 does not have a DOS Command choice.)

To set WordPerfect to print to a file, type Shift-F7, highlight the name of the printer for network printing, then choose Edit, Port, Other, and type in the filename to use, complete with drive and directory. Press Enter once to finish the file name entry, and a second time to return to the Print: Select Printer screen. To select the highlighted printer, choose Select, then press Enter or F7 to return to the editing screen.

After this is done, whenever you print with the selected printer, the program will print to disk, using the filename you designated. You could send the file to your network printer manually by typing Ctrl-F1, choosing DOS Command, typing the command LPR FILENAME, and pressing Enter. But you'd probably prefer to relegate this task to a macro. Assuming you're printing to the file C:\WPTEMP, for example, the macro would read

```
{Shell}clpr·c:\wptemp{Enter}{Enter}
```

The easiest way to create this macro is to record it. Note that the first `{Enter}` actually enters the command. The second `{Enter}` returns you to WordPerfect after the command is finished. As always in a WordPerfect macro, the midline dot represents a space.

Loading the necessary TSRs from within a batch file associated with your DOS session means they're active only when a DOS session is active.

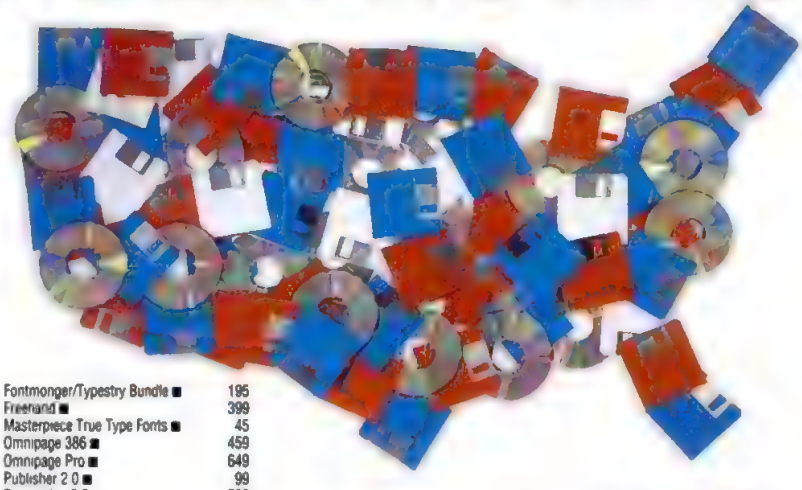
There are any number of touches you may want to add. For example, you may want to reclaim the space on your disk by deleting the print file after you finish printing. If so, you could add a second Shell command:

```
{Shell}cdel·c:\wptemp{Enter}{Enter}
```

If you want to give a series of DOS-level commands, you can give as many Shell commands as you like. However, shelling out to DOS repeatedly can be visually distracting if you're not using the {DISPLAY OFF} command, and this process takes time. An alternative is to

DUSTIN DELIVERS HERE. *FREE!*

DOS ●
WINDOWS ■
MPC ✚
O/S2 ◆
MAC ▲
HARDWARE ★



ACCOUNTING & FINANCE

CA BPI Accounting 2 ●	159
In The Black ■	65
MS Money ● ■	25
One Write + 4.0 ●	49
Peachtree Accounting Release 2 ■	125
Peachtree Complete 7.0 ●	195
Quicken 7 0 ●	49
Quicken 3 0 ■	49
Simply Accounting ● ■	79
Stagesoft Accounting ●	99
Turbo Tax ● ■	CALL

BUSINESS GRAPHICS

Action Comp. Upgrade ■ ▲	99
Action ■	209
Action ▲	349
allClear ● ■	195
CA Cricket Paint ■	99
CA Cricket Presents ■	99
Flowcharting III ●	145
Freelance Graphics ● ■	CALL
Freelance Graphics Upgrade ● ■	109
Harvard Graphics 3.0 ■	275
Harvard Graphics 3.0 Upgrade ■	95
Informs ■	CALL
Powerpoint ■	325
Powerpoint Upgrade ■	135
Stanford Chart ■	65
Stanford Graph ■	369
Visio 2 0 ■	129
Visio Home ■	85
WP Presentation ●	309

CAD & DRAFTING

Autosketch ● ■	CALL
Design CAD 3D ●	259
Drafix CAD ■	259
Design CAD 2-D ● ■	185
Generic CAD ●	299
Turbo Cad ■	85

COMMUNICATIONS & NETWORKING

Commworks ● ■	139
Crosstalk 2 0 ■	129
Crossfax ■	CALL
Desk To Desk ●	CALL
Eclipse Fax ■	75
Hyperaccess 5 ●	69
Laplink Pro 5 0 ●	119
Netware ● ■ ★	CALL
PC Anywhere Host/Rmt ●	125
Procomm Plus ●	79
Procomm Plus ■	99
Q-Modem ●	69
Reachout ■	CALL
Remote Power On/Off ★	129
Winfax Pro Network ■	265
Wildcat BBS ●	89
Winfax Pro ■	89

DATABASE & DEVELOPMENT

Access ■	CALL
Approach ■	109
CA Clipper 5.2 ●	499
CA Clipper 5.2 Comp. Upgr. ●	149
CA dBFast ■	195
dBase IV ●	469
FileMaker Pro ■	135
Foxpro 2.5 Upgrade ● ■	199
Foxpro 2.5 ● ■	329
Paradox ●	549
Paradox ■	155
Q & A 4 0 ●	265
Q & A 4 0 ■	175
Rbase ●	495
Superbase ■	CALL

DESKTOP PUBLISHING & FONTS

Express Publisher ● ■	109
Facelift For WP ●	75
Facelift ■	69
Fontmonger ■	99
Fontmonger/Typestry Bundle ■	195
Freehand ■	399
Masterpiece True Type Fonts ■	45
Omnipage 386 ■	459
Omnipage Pro ■	649
Publisher 2 0 ■	99
Pagemaker 5.0 ■	599
Printshop Deluxe ●	55
Type Align ■	69
Typestry ■	175

EDUCATION & TRAINING

Auto Insight ● ■	55
Automap ● ■	65
Autoworks ●	47
Body Insight ● ■	55
Body Works 3 0 ● ■	39
Complaints Desk ●	99
Computer Works ●	35
Green Explorer ●	49
Holy Bible ●	35
Kid's Desk ●	35
Orbits ●	35
PharmAssist ●	47
Places to Play ●	45
Resume 2 0 ●	CALL
Sales and Marketing Success ●	59
Sportsworks ●	35
Success Inc ●	85
Typing Tutor VI ● ■	39
UFO ●	35
Where Is Carmen-World Deluxe ●	55

GAMES & ENTERTAINMENT

Alone In The Dark ●	45
Capitalist Pig ■	45
Commanchee Overkill ●	35
Falcon 3 0 ●	55
Flight Simulator 5.0 ●	49
Links PRO 386 ●	49
Manhole ●	39
Playmaker Football ●	25
Rodney ●	39
Simcity ● ■	CALL
Thrustmaster ★	79

GRAPHICS & CLIPART

Click Art ● ■	CALL
Canvas ■	285
Corel Draw 3 ■	139
Corel Draw 4 ■	395
Corel Draw 4 Version Upgrade ■	239
Corel Ventura ■	179
Designer ■	489
Harvard Draw ● ■	189
Hijaak ●	105
Hijaak Pro ■	89
Illustrator 4 0 ■	459
Painter ■	275
Photoshop ■	589
Picture Publisher ■	449
Presentation Task Force ● ■	129

INFORMATION & PROJECT MANAGEMENT

Act! ■ ●	275
Ascend ■	145
Commence 2.0 ■	265
Descriptions Write Now ●	95
French Assistant 5.0 ●	65
German Assistant 5 0 ●	65
Italian Assistant 5.0 ●	65
Lotus Organizer ■	109
Manage Pro 2.0 ■	225
Organize Your Way ■	69
Packrat 5 0 ■	255
Policies Write Now ●	125
Power Translator (French) ●	155
Power Translator (Spanish) ●	155
Project ●	329
Project ■	455
Sharkware ■	95
Spanish Assistant 5.0 ●	65
Timeline 5 0 ● ■	475

INTEGRATED

MS Office Professional ■	CALL
MS Office Standard ■	489
MS Office Upgrade ■	CALL
Simply Business Bundle ■	425
Smart Suite ■	CALL

MATHEMATICAL

Derive 2 5 ●	155
Mathematica DOS Enhanced ●	735
Mathematica DOS Standard ●	489
Mathematica Windows Enhanced ■	819
Mathematica Windows Standard ■	489

MODEMS

Hayes Accura 14 4 Ext. ★	245
Hayes Accura 14 4 Int. ★	219
PM14400FX Send/Rec Fax ★	225
Sportster 14.4 Int. ★	199
Sportster 9600 ★	CALL
WorldPort 9600 ★	419

OPERATING SYSTEMS

MS DOS 6.2 Upgrade ●	59
Windows 3.1 ■	99
Windows 3 1 Upgrade ■	59
Windows NT ■	CALL
Windows for Workgroups ●	CALL

PERIPHERALS & ACCESSORIES

Cyberman ★	89
Easy Touch Scanman ★	235
Mouseman Serial ★	79
MS Mouse ★	85
Trackman Serial ★	59

PROGRAMMING

Quick Basic ● ▲	135
SPF/PC ● ▲	195
Turbo C++ 3.0 ●	75
Turbo C++ ■	109
Turbo Pascal 7 0 ●	115
Visual Basic ● ■	139
Visual C++ Standard ■	139
Visual C++ Professional ■	329

SPREADSHEETS

123 v4.0 ■	329
123 v4 0 Upgrade ■	109
CA Complete ■	CALL
Excel Comp.& Version Upgrade ■	109
Excel 5 0 ■	315
Improv 2 1 ■	339
Quatro Pro 5 0 ● ■	55

UTILITIES

386 Max ●	69
After Dark ● ■	35
Any View ■	49
Carbon Copy ● ■	139
Corel SCSI ● ■	75
Direct Access ● ■	CALL
Doubletools for Doublespace ● ■	69
Easy Menu 5 0 ■	CALL
Eclipse Find ■	45
Fantastic Recall ■	39
Mac in Dos ● ■	CALL
Norton Antivirus ● ■	95
Norton Desktop ● ■	125
Norton Utilities 7.0 ●	125
PC Tools Deluxe 8 0 ● ■	99
PC Weatherman ● ■	35
Perfected ●	49
PK Zip ●	49
QEMM 386 ■	69
Ready Aim File ■	89
Spacemanager ● ■	35
Spinrite 3 1 ●	89
Stacker 3 1 ● ■	99
Star Trek Screen Saver ■	39
Super PC Kwik ●	45
Superstor Pro ● ■	89
Uninstaller ■	49
Winsleuth Gold ■	65

WORD PROCESSING

401 Great Letters ■	39
Ami Pro v3 01 ■	255
Ami Pro v3.01 Upgrade ■	CALL
By Design for WP ● ■	65
LetterPerfect ●	99
MS Word 6 0 ●	329
MS Word 6.0 ■	319
Perfected! ●	39
WordPerfect 6.0 ● ■	299
WordPerfect Upgrade 6 0 ● ■	CALL

CD-ROM SOFTWARE

BUSINESS SOFTWARE

9 Digit Zip Code Directory ●	35
Corel Draw 3 0 ■	139
Corel Draw 4.0 ■ ✚	395
Direct Phone ● ■	99
Global Explorer ■	99
Phone Disk USA ●	59
Select Phone ● ■	179
Street Atlas USA ■	99

CLIPART & GRAPHICS

Corel Clip Art ■ ▲	CALL
Publisher's Paradise ● ■	35

EDUCATION & TRAINING

Animals ✚	55
History of the World ■ ✚	55
Mavis Beacon Teaches Typing ● ✚	39
Monarch Notes ● ▲	49

ENCYCLOPEDIAS

Grolier's MM Ency. Upgrade ● ■	99
Grolier's MM Encyclopedia ● ■	199

ENTERTAINMENT

20th Century Video Almanac ●	55
Aegis ■ ✚	59
Critical Path ■ ✚	55
Dinosaurs ✚	59
Dune ●	59
Hell Cab ●	69
Inca-CD ●	49
King's Quest VI ●	55
Legend of Kyrandia ■	45
Oceans Below ✚	35
Scrabble ■	35
Seventh Guest ●	59
Space Shuttle ● ■	35

GENERAL REFERENCE

Auto Insight ● ■	CALL
Beatles Hard Days Night ✚	35
Berlitz Spanish or French ✚	109
Body Insight ● ■	CALL
Human Calculator ✚	35
JFK Assassination ✚	45
MS Bookshelf 1993 ■	135
Sports Almanac ✚	45
The Animals ■	55
Time Table of History ●	59
U.S Atlas ✚ ■	39
UFO ■	39
World Atlas ✚ ■	39

MUSIC SOFTWARE

MS Beethoven ✚	59
MS Musical Instruments ✚	59
Soundsations ✚	CALL

SHAREWARE & UTILITIES

CD Speedway ■	65
Software Vault Gold ● ■	25

CD-ROM HARDWARE

ACCESSORIES

CD Caddies (6-pack) ★	39
Hello Music ★	275
Reelmagic Card ★	389

CD-ROM DRIVES

NEC CDR 500 3x-i ★	519
NEC CDR 400 3x-p ★	469
Sony Double Speed External ★	299
Sony Double Speed Internal ★	249
Toshiba 3401 External ★	519
Toshiba 3401 Internal ★	429

MULTIMEDIA KITS

Fusion Double CD 16 LX ★	479
Korg Speakers ★	CALL
Memphis Subsystem ★	799
Multimedia Station Pro with NEC 3X Drive ★	799
Multimedia Station Pro with Sony Double Speed Drive ★	449
Multimedia Station Pro with Toshiba 3401 Drive ★	679
Sound Blaster Kits ★	CALL
WinStorm Kit ★	575
Yamaha Speakers ★	CALL

SOUND CARDS

Pro Audio Spectrum 16 ★	179
Pro Audio Studio 16 ★	235
Sound Blaster 16 ASP ★	235
Sound Blaster 16 ★	179

DUSTIN DISCOUNT SOFTWARE

Plain Wrap Prices, Black Tie Service.

20969 Ventura Blvd. Woodland Hills, CA 91364 (818) 710-9174

Call Toll Free To Order
1-800-765-6214
Fax Your Order 24-hours
1-818-884-5310

THE DUSTIN DIFFERENCE

Free Ground Shipping • Same Day Shipping
Overnight Delivery Available • PO's Welcome
Government & Educational Pricing
Visa, MC & AMEX Accepted

We will promptly replace any defective items returned within 30 days, but cannot guarantee compatibility. There is a 15% restocking fee on any non-defective, unopened goods, and all returns must be accompanied by a Returned Merchandise Authorization. Software prices do sometimes fluctuate beyond our control and may change, for better or worse, without notice. While ground shipments are free, we do ask $11 per item for 2-day, $22 per item for overnight, and $5 for C.O.D. Although shipping heavier items may be slightly more, bulk orders can be a lot less. Please call us for any item not listed.

CIRCLE 347 ON READER SERVICE CARD

THE DUSTIN DIFFERENCE

No Credit Card Surcharges
Credit Card Not Charged Until Shipping
Manufacturers' Warranties
Call for Any Items Not Listed

Since 1982

ComputAbility
Consumer Electronics

Since 1982

PMB 1-25 toll free fax: 800-554-9981

800-554-9930

COMPUTERS

DESKTOP

NEC

- Ready 425ES, 486 SX25 4MB/170MB $999
- Ready 433ES, 486 SX33 4MB/210MB $1,239
- Ready 466ES, 486 DX2/66 4MB/250MB $1,729
- Ready Multimedia 433 CD3, 486 SX33 4MB/250MB Triple Speed $1,879

CALL ABOUT SPECIAL NEC REBATES!

PACKARD BELL

- Force 250, 486 SX/33 4MB/245MB $1,049
- Force 2010 Multimedia, 486 SX25 4MB/170MB w/ CD ROM $1,229

NOTEBOOK

EPSON

- Action Note 4SLC2/50, 4MB/120MB $1,599
- Action Note 4SLC2/50, 4MB/170MB $1,799
- Action Note 4000 SubNotebook, 486 SLC/25 4MB/80MB / 4MB/120MB .... $1,599 / $1,799

TEXAS INSTRUMENTS

- TravelMate 4000, 486 SX25 Adv. Color 4MB/120MB $2,099
- TravelMate 4000, 486 DX2/40 Passive Color 8MB/200MB $2,950
- TravelMate 4000, 486 DX2/50 Active Color 4MB/200MB $3,799

CALL FOR OTHER MODELS!

DAUPHIN

- DTR-1, 486 SLC/25 8MB/40MB w/Fax & Ethernet $3,049

CPU UPGRADES

Cyrix — $5 shipping on all CPU upgrades!

Upgrade Chips:

- CX 486 DRX2 16/32 .... $279
- CX 486 DRX2 20/40 .... $319
- CX 486 DRX2 25/50 .... $369
- CX 486 SRX2 20/40 .... $249
- CX 486 SRX2 25/50 .... $279

intel

- SX 20 / 25 .... $315 / $369
- DX 25 / 30 .... $369 / $529

PCMCIA

FREE SHIPPING ON ALL PCMCIA!

MODEMS:

- ATI Express S/R 14.4 .... $369
- Intel S/R 14.4 .... $285
- Hayes Optima S/R 14.4 .... $349
- AT&T Keep in Touch S/R 14.4 Cellular Comp. $349
- US Robotics World Port S/R 14.4 .... $309
- Megahertz XJ1144 S/R 14.4 .... $329
- Piiceon S/R 14.4 Cellular Comp. $329
- Supra ComCard S/R 14.4 .... $299

NETWORKING:

XIRCOM

- CreditCard Enet 16bit, 10-B2, 10BT $309
- CreditCard Enet 16bit Thin $269
- CreditCard Enet 16bit, 10BT $269

NATIONAL SEMI CONDUCTOR

- InfoMover NE 4100T, 10BT $219
- InfoMover NE 4100MC-1 Coax $219

THOMAS CONRAD

- TC 5041-T, 10BT $269
- TC 5056T Enet 16/32bit, 10BT $279

SOCKET COMMUNICATIONS

- 10BT 8/16 .... $299
- 10BT Removable $299
- 10BT Plus BNC Removable $319

CONTROLLERS:

- Adaptec Slim SCSI $289
- Socket SR 700 I/O Card $169

TOKEN RING:

- Madge Pocket Ring Node 16/4 .... $629
- IBM PCMCIA 16/4 TokenRing $469

MEMORY CARD:

- Verbatim SRam 2MB Type2 .... $349
- Verbatim SRam 1MB Type 2 .... $219

HARD DRIVES:

- Maxtor 105MB Type 3 .... $579

MICE

MICROSPEED

- Microtrac PC 3 Button $65
- Microtrac Mouse Deluxe $39
- PC Trac Serial Trackball with Driver 3.0 .... $75
- WinTrac Trackball $89

KENSINGTON.

- Expert Trackball Serial $95

MICROSOFT

- MS Ball Point Mouse 2.0 Portable $82
- MS Serial Mouse 2.0 .... $75

PRINTERS

EPSON

- Action Laser Printer 1000 512K .... CALL
- Action Laser Printer 1500 1MB / 2MB .... CALL
- Stylus 800 Ink Jet .... CALL
- Stylus 300 Ink Jet - NEW .... CALL
- Ink Master Printer .... CALL

NEC

- Silentwriter M95, 6ppm PS $865
- M95fx (M95 w/FAX) $1079
- Silentwriter Superscript 610 NEW $619
- Silentwriter 1097 .... $1,349
- SuperScript 610 .... $609

Primera

High resolution thermal transfer printing. Great for presentations & overheads $695

OKIDATA

- ML320/ML321 .... $299/$419
- 590/591 .... $419/$569
- 395/395C .... $949/$1,019
- 810/830+/850 .... $895/$1,079/$849
- 400e/410e .... $499/$649

star

- NX-2420 Rainbow $255
- NX-2430 Black $205
- Star SJ 144 NEW! $469
- NX-2450/NX-2480 .... $225/$249

TEXAS INSTRUMENTS

- MicroMarc Ink Jet $275
- MicroWriter Basic, 5PPM Laser $509
- MicroWriter PS23 5PPM with PS. $679
- MicroLaser Pro 600 PS23 .... $1,329

Canon

- BJ200 Ink Jet .... CALL
- BJ 600 Color Ink Jet $585
- LBP 430 Laser $585

MODEMS

ZOOM NEW LOWER PRICES!

Free Prodigy Starter Kit with purchase of any Zoom Modem!

- V.32 bis Send/Receive 14,400 for DOS or Win
  - Internal / External .... $129 / $155
  - w/ Voice Int/ Ext .... $159/$185
- Zoom 14.4 PKTExternal $225
  - with Voice $265
- V. Fast Class 24.4 bps
  - VFP 24K Int/ VFX 234 Ext .... $169/$195

Supra Corporation

- SupraFaxModem Internal 24/96 NEW! $53
- Supra 2400 External $59
- SupraFaxModem 144LC, Class 1 only External DOS / Windows $155
- SupraFaxModem V.32 bis, Internal with FaxSoftware DOS/Win $135
- SupraFaxModem V.32 bis, Ext. alone $189
  - with Fax Software, DOS/Win $199
  - with Fax Software Mac $215
- Supra Com Card, PCMCIA, 14.4/14.4, S/R, Free Delivery! $299

US Robotics

- Sportster 14.4 Int. / with Fax .... $145/$149
- Sportster 14.4 Ext. / with Fax .... $159/$169
- Courier V.32 Terbo Int/ with Fax .... $415/$429
- Courier V.32 Terbo Ext/ with Fax .... $465/$479

intel

- 14.4 Fax Modem Int/Ext .... $159/$189

AT&T

- 14.4 Fax Modem Int/Ext .... $149/$185
- AT&T Notebook, PCMCIA 14.4 FREE DEL $349

FLOPTICAL

VALUE STOR

- SUPER 21MB External, Includes 8 bit host adapter and software $379
- VALUE STOR 21MB Internal Includes 3.5" drive, 8 bit SCSI host adapter, cable & software $309

FLOPPY DRIVES

Floppy Drives

- 3.5" without Frame 1.44MB PC/AT $55

TEAC

All Media Floppy

- The All-In-One 3.5" & 5.25" Half Height Internal Floppy Drive $125

HARD DRIVES

Seagate

All Seagate Drives Include: Universal Installation Manual, AT Rails & Cable

- ST-251-1 MFM $239
- ST-352A/3102A IDE .... $115/$165
- ST-3144A/3243A IDE .... $165/$199
- ST-3390N SCSI $385
- ST-3209A/3390A IDE .... $219/$295
- ST-9145A/3550A IDE .... $315/$399

FREE DELIVERY:

- ST-3655A/3655N .... $579/$589
- ST-3550N SCSI $529
- ST-11200N/11950N .... $929/$1739
- ST-42100N/42400N SCSI .... $1389/$1679
- ST-12550N $2249

Maxtor

- IDE 7131A/7245A / 7345A ... $179 /$235/ $299
- IDE 7546A/540A - FREE DEL .... $599/$719
- SCSI 7245 / 7345S .... $255 / $349
- SCSI 540SL - FREE DELIVERY $779

CONNER The Storage Answer

- CFA170A/340A .... $199/$285
- CFA170S/CFA340S .... $209/$305
- CFP1060S FREE DEL $939
- CP30204/CP30254 IDE .... $219/$265
- CFS 420A $379
- CFP 1060S SCSI FREE DEL $1049
- CP30254H IDE $235
- CP30544 IDE FREE DEL $625
- CP30540 SCSI-2 FREE DEL $625
- CP31370 SCSI-2 FREE DEL $1049

Quantum

- ELS 127 IDE / SCSI .... $195 / $199
- ELS 170 IDE / SCSI .... $189 / $195
- LPS 270 IDE / SCSI .... $265/$279
- 540 IDE / SCSI FREE DELIVERY .... $609/$639
- PD 1050 SCSI FREE DELIVERY $929
- PD 1225 SCSI FREE DELIVERY $1049
- PD 1800 SCSI FREE DELIVERY $1329

MICROPOLIS

FREE DELIVERY(contiguous 48 states)

- 1926 / 1936 SCSI .... $1545/$2219
- 2210 / 2217 SCSI .... $909/$1199
- 2210A / 2217A IDE .... $909/$1199
- 2210AV / 2217AV .... $1029/$1339

WESTERN DIGITAL

Featuring CAVIAR

- AC1210/AC2250 .... $199/$225
- AC2340/AC2420 .... $265/$339
- AC2540 .... $519

CONTROLLERS

adaptec

- 1522 SCSI Direction Kit: 16 Bit Standard SCSI with Floppy Support & Drivers $135
- 1522 SCSI Direction PLUS Kit $189
- 1542CF Single $195
- 1542CF SCSI Master Kit / PLUS .... $249/$305
- 2742 Single NEW $295
- 2742T Kit NEW $349
- 2742T Single NEW $325
- 2842 VL Master Kit $299
- Mini Scsi
  - T-130/T-160 .... $65/CALL
  - T-260/T-338 .... $155/$95
  - T-348/T-358 .... $185/$205
- Slim SCSI, APA-460, PCMCIA, Free Del $289

FUTURE — 1680 SVP-ISA

- TMC-850 MCD CD ROM Kit $55
- 1680 SVP-ISA, 16 bit SCSI 2 with floppy support & CD ROM SCSI support $129
- 700 EXSVP-EISA $369

OTHER

- Seagate ST-01 SCSI 8 Bit Adaptor $29
- Seagate ST-02 SCSI 8 Bit Adaptor w/FD Cont. $45
- DTK PTI 227, 2 Serial, 1 parallel, 1 game port, 1 floppy disk controller, 1 embedded hard disk drive adapter $29

TAPE BACK UP

COLORADO MEMORY SYSTEMS INC.

- JUMBO - Low Cost Tape Backup
  - DJ10-120MB $105
  - DJ20-250MB $165
- JUMBO TRAKKER - External Parallel Printer Port Tape Backup System.
  - JT10(40-120) $269
  - JT20 (80-250) $315
- POWERTAPE SYSTEM includes Colorado Backup for DOS software 2GB Int / Ext, Free Delivery! .... $945 / $1089

MONITORS

CTX

- 5439A, 14", .39DP 1024 768, Inter $225
- 5468A, 14", .28DP 1024x768, Inter $255
- 1451NI, 14", .28DP 1024x768, NI $269
- 1560, 15", .28DP 1028x768, NI $395
- 1760F, 17" Flat, .31DP, 1280x1024, NI $739

SONY

- CPD 1320 UC2, 14", 640 x 480 VGA, ... $335
- CPD 1430S, 14", 1024 x 768, NI, 8514A, .25 MM, cables & stand $585
- CPD 1730S, 17", 1024 x 768, NI, Free Del ... $1,039
- CPD 17SEI, 17", Free Delivery! $1,229

NEC

- SVGA 14" 1024x768 NI, .28 mm dot $305
- 5FGe, 17", .28, 1024x768, 76Hz $1,045
- NEW Multi Sync.
  - 4FGe EnergyStar Comp. $669
  - 5FGp Optical Surface $1329
  - 3V EnergyStar Compliant $50 Rebate thru 1/31/94 .... $499

MAG

- MX15F/MX17F .... $515/$929

NANAO

- F3401W / F550I .... $689 / $995
- F550IW / F560IW .... $1189 / $1429

PACKARD BELL

- PB8538 SVGA, 14", .39, 1024x768 .... $249
- PB8549 SVGL, 14", .28, 1024x768, NI $339
- PB8515 SVGL, 15", .28, 1024x768, NI $429
- PB8517 SVGM, 17", .28, 1280x1024, NI $819

SCANNERS

RELISYS

AVEC Three Pass, Flatbed, Color Scanners

- 1200 PC $599
- 2400 PC $799
- 4800 PC $989

Reli Single Pass, Flatbed, Color Scanners

- 2400 PC $1379
- 9600 PC $2779

LOGITECH

- Scanman 256 (gray scale) $165
- Scanman 256 with Omni Page Direct $209
- Scanman Color with Omni Page Direct $429
- FotoMan Plus $529
- Scanman Easy Touch $215

EPSON

- ActionScanning System PC .... CALL
- ES-800C Bundle .... CALL
- ES-800C Professional PC Bundle .... CALL

Mustek

- ScanMagic 400 dpi Handheld 256 gs / Color Handheld .... $115 / $229
- GrayArtist Handheld 800 dpi $149
- PrinScan 105, Handheld, 400 dpi $165
- ColorArtist Pro Handheld 800 dpi $349
- Paragon 600 Flatbed FREE DEL $839

POWER SUPPLY

TRIPP LITE THE POWER PEOPLE

BC Series Standby UPS Systems

- BC 250 250 VA, 2 outlet $95
- BC 400 400 VA, 2 outlet $149
- BC 500 500 VA, 4 outlet $179
- BC 400LAN 400 VA, 4 outlet, LAN inter ... $149
- BC 500LAN 500 VA, 4 outlet, LAN inter ... $189
- BC 600LAN 600VA, 4 outlet, LAN inter. ... $245
- BC 750LAN 750 VA, 4 outlet, LAN inter ... $299
- BC 900LAN 900 VA, 4 outlet, LAN inter ... $345

Omnipower Line Interactive UPS

- OMNI 500LAN 450 VA $249
- OMNI 600LAN 600 VA $295

APC American Power Conversion — LOWER PRICES!

Back Ups

- 250 / 400 .... $99 / $155
- 450 / 600 .... $185 / $255
- 900 / 1250 .... $365 / $489

Smart Ups

- 370 / 400 .... $309 / $285
- 600 / 900 .... $335/$535
- 1250 .... $689

NETWORKING

ARTISOFT

- AE-2 Ethernet Adapter $179
- Node Runner 2000C Adapter $159
- Node Runner 2000C Starter DOS/Win $409/$465
- Node Runner SI2000C Coax / 5 Pk .... $89/$429
- Node Runner SI2000T Coax / 5 Pk .... $89/$429
- Z Two Station Kit $81
- Artisoft Central Station / II .... $319/$379
- AI Dos/Win .... $77/$89
- Simply LANtastic Intrenal Add-On Kit $97
- Simply LANtastic Software Kit $189
- Simply LANtastic Internal Starter Kit $189

3Com

- Etherlink II 16 TP 8/16 Bit (503-16TP) $159
- Etherlink II/16 8/16 (503-16) $149
- Etherlink III Coax $119
- Etherlink III TP $119

CALL FOR 5 PACK PRICING!

SMC

- SMC Ethercard Ultra Elite 16C Combo ... $119
- SMC Ethercard Ultra Elit 16T $99
- SMC Ethercard Ultra Elite 16 .... $99
- SMC Ethercard Plus Elite 16 .... $115
- SMC Ethercard Plus Elite 16T $115
- SMC Ethercard Plus Elite 16 Combo $135

CALL FOR 6 PACK PRICING!

National Semiconductor

- Infomover NE2000 CTA-1 .... $109
- Infomover NE2000 C-1 .... $99
- Infomover NE2000 T-1 .... $89
- Infomover NE4100 T-1 .... $199
- Infomover NE4100 C-1 .... $199

CALL FOR 5 PACK PRICING!

NOVELL — **National Semiconductor**

- Personal Netware Single User1-0 .... $65
- Personal Netware 5 User $259
- Personal Netware Starter Kit Coax $239
- Personal Netware Add-On $149

intel

- Etherexpress 16 Bit Coax $99
- Etherexpress 16 Bit Coax 10BT $99
- Etherexpress 16 Bit Flash Coax $129

CALL FOR 5 PACK PRICING!

VIDEO BOARDS

DIAMOND

- Speedstar Pro, 1MB/VLB .... $115/$115
- Stealth 1MG $199
- Stealth 24, ISA / VLB .... $155/$155
- Stealth Pro, ISA, 1MB / 2MB .... $235/$329
- Stealth Pro, VLB 1MB / 2MB .... $245/$329
- Viper VLB 2MB $399

ATI

- VGA Wonder GT Windows Accel. $165
- ATI Graphics plus 2MB $229
- ATI Ultra Pro 2 MB / VLB .... $394 / $349
- ATI Ultra Pro EISA 2MB $375

NUMBER NINE

- 9GXE, 1230 x 1024 NI, SVGA.
  - LVL 10, 1MB $239
  - LVL 11 2MB $349
  - LVL 12, 3 MB $429
  - LVL 14, 4MB $629

Hercules

- Dynamite VL Pro SVGA 1MG/2MG .... $159/$205
- Graphite VL Pro HG SVGA 610/720 .... $249/$385

MULTIMEDIA

TURTLE BEACH

- Maui wavetable synthesizer Upgrade, ... $159
- Wave/Turtle Tools Bundle $94.95

ADS

- VGA TV Elite Int./ Ext. .... $189/$235
- Video Clipper/PC Prime Time .... $315/$325

CREATIVE

- WAVE Blaster $179
- Video Blaster for Windows $325
- Video Spigot $239
- TV Coder $149

SIGMA DESIGNS

- Reel Magic/SCSI Version .... $379/$429
- Win Storm $185

TECH INFO: (414) 357-8181 • FAX: 800-554-9981 • HRS (CST): M-F 8am-8pm, Sat 9am-5pm

Since 1982

ComputAbility

Consumer Electronics

PMC 1-25

toll free fax: 800-554-9981

800-554-9930

WINNER of eight awards!

Including: "Best Overall Software Supplier"

- Best Sound Card - Sound Blaster
- Best Input Device - Microsoft Mouse 2.0
- Best Communications - Procomm +(W)
- Best Presentation - Corel Draw
- Best Personal Financial - Quicken 2.0/Windows
- Best Entertainment - Kings Quest V
- Best Disk Utilities - PC Tools for Windows

Where the Top 50 Software Titles are Always on Super Sale!

1	MS Windows 3.1	88.95	11	MS Word 6.0 for Windows	299.95	21	Paradox 4.5 for Windows	138.95	31	Quicken 7.0 for DOS	41.95
2	WordPerfect 6.0 DOS	284.95	12	OS/2 2.0 for Windows	49.95	22	Quattro Pro 5.0 for DOS	42.95	32	Hijack Pro 2.0 Windows	79.95
3	MS Excel 5.0 for Windows	304.95	13	WinFax Pro 3.0 for Windows	78.95	23	MS Windows for Workgroups 3.1	154.95	33	MS Scenes Impressionists Collect.	24.95
4	Lotus 123 Release 4 for Windows	294.95	14	Norton Utilities 7.0	111.95	24	MS Flight Simulator 5.0	43.95	34	WordPerfect for 6.0 Windows	284.95
5	Qemm 7	62.95	15	Procomm Plus 2.01 for DOS	68.95	25	Saber LAN Workshop	67.95	35	Print Cache 3.1	44.95
6	MS DOS 6.2	49.95	16	Procomm Plus 1.02 for Windows	93.95	26	MS Power Point 4.0 for Windows	304.95	36	PrintShop Deluxe V 1.2 DOS	46.95
7	MS Publisher 2.0 for Windows	86.95	17	Harvard Graphics 2.0 for Windows	249.95	27	MS Visual Basic 3.0 for Win Stand	124.95	37	Laplink V	[illegible]
8	MS Access 1.1	299.95	18	Quicken 3.0 for Windows	41.95	28	CA Clipper V 5.2	509.95	38	Lotus Freelance Graphics Win 2.0	324.95
9	Quattro Pro 5.0 for Windows	42.95	19	MS Office 4.0 for Windows	459.95	29	Corel Draw 3.0 for Windows	124.95	39	MS Works 3.0 Win ($ thru 12/31/93)	74.95
10	After Dark for Windows V 2.0	28.95	20	Claris File Maker Pro	119.95	30	PC Anywhere V 4.5 Host & Remote	112.95	40	MS Project 3.0 for Windows	424.95

41	7th Guest-CD	58	46	Claris Works 1.0 for Windows	119.95
42	MS Windows NT 3.1	299.95	47	Compuserve Win Membership	26.95
43	MS Money 2.0 for Windows	26.95	48	Lotus Notes 3.0 Starter	817.95
44	Privateer	47.95	49	PC Tools Pro 9.0	86.95
45	Return to Zork-CD	49	50	Quicken Companion 2.0 Win	24.95

CD-ROM BUNDLES

CREATIVE New!

- Omni CD Internal Double Speed ....CALL
- Digital Edge Multimedia Kit $629
- Discovery/Edutainment ....CALL

MEDIA VISION

- Pro 16 Multimedia System II, FREE DEL....$799
- Fusion Double CD 16, NEW FOR '93! $499
- Media Vision Memphis Ext. FREE DEL....$779

TURTLE BEACH

- MultiSound w/ NEC 3Xi FREE DEL....$1299

For Bare Drives See Grid!

SPEAKERS

LOWERPRICES!

- ACS-50 / 150 ....$75 / $99
- ACS-100 / 300 ....$129 / $269

YAMAHA

- Yamaha Digital Speakers (YSTM10H) $89

ACOUSTIC RESEARCH

- AR Partner 22 Black $75
- AR Partner 42 Gray $149
- AR Partner 570 Gray $279
- AR Partner 622 Gray $219

SOUND CARDS

CREATIVE New!

- Sound Blaster 16 Basic $129
- Sound Blaster Deluxe $85
- Sound Blaster Pro Deluxe $115
- Sound Blaster 16 Multi CD $159
- with adv. signal processing $195
- Sound Blaster 16 Scsi 2 ....$179
- with adv. signal processing $209

MEDIA VISION

- Pro Spectrum 16 Basic $115
- Pro Audio Spectrum 16 ....$155
- Pro Audio Studio 16 ....$199

TURTLE BEACH

- MultiSound Monterey Free Del $519
- Maui Wavetable Synthesizer Upg $159
- Wave for Windows $39*

*with purchase of any sound card!

OTHER

- Advanced Gravis UltraSound $129
- Logitech SoundMan 16 ....$105
- MS Sound System 2.0 w/board $139
- Diamond Sonic Sound $215
- Roland SC-7 Sound Board $319
- RAP-10 Roland Audio Producer FREE DEL....$469
- Calypso Audio Magician Plus NEW! $79
- Orchid Soundwave 32 ....$219

SOFTWARE

- 386 To The Max 7.0 w/Move Em 58.95
- ACT! 1.1 for Windows 249.95
- Adobe Photoshop 2.5 for Windows 534.95
- Adobe Streamline 3.1 for Windows 119.95
- AskSam 1.0 for Windows 217.95
- Auto Switch 2.0 for Windows 204.95
- AutoCAD LT 1 for Windows 429.95
- Back-It 2.0 for Windows 44.95
- Borland Office 1.5 for Windows 224.95
- Borland Super Pack for Windows 162.95
- Business Works 6.0 for Windows 549.95
- CA Realizer 2.0 for Windows 72.95
- Calendar Creator Plus 1.0 for Windows 39.95
- Carbon Copy 2.0 for Windows 126.95
- Central Point PC Tools Pro 9.0 ....86.95
- Communications Suite for Windows 108.95
- Corel Draw 4.0 for Windows 374.95
- Corel Ventura 4.2 for Windows 159.95
- Design CAD 2D for Windows 169.95
- Direct Access 1.0 for Windows 62.95
- DoubleTools 1.0 ....59.95
- Eclipse Find for Win (thru 1/31/94) 37.95
- Fax and Find for Windows 154.95
- Faxworks Pro for Windows 79.95
- Form Flow for Windows 122.95
- Harvard Graphics 3.0 for DOS 364.95
- Info Select 2.0 ....81.95
- Lotus 123 3.4 ....394.95
- MS Visual C++ Professional for Win 3.5 ....304.95
- NetRoom V 3.0 ....59.95
- Norton Antivirus V.3.0 DOS & Win 82.95
- Norton Commander 4.0 ....62.95
- Norton Desktop 3.0 for Windows 112.95
- Norton Speed Drive 4.0 for DOS/Wins 63.95
- OmniScan 1.0 for Windows 289.95
- PC Anywhere 1.0 for Windows 124.95
- Peachtree Complete 7.0 ....176.95
- PhotoShop 2.5 for Windows 534.95
- Presentation Task Force 4.0 for Win 116.95
- PrintShop Deluxe V 1.2 for Windows 46.95
- Q Modem Pro for Windows 86.95
- Quark Xpress for Windows 544.95
- Stacker 3.1 ....91.95
- TaxCut Head Start DOS or Win 12.95
- Uninstaller 44.95
- VISio 2.0 for Windows 119.95
- WinProbe for Windows 46.95
- WinSleuth Gold 3.5 ....56.95
- WordPerfect 6.0 & Quattro Pro 5.0 Bundle 304.95
- WordPerfect Presentation for Windows ....[illegible]95

UPGRADES

- Ami Pro Windows Version Upgrade 59.95
- CA Clipper 5.2 Competitive Upgrade 139.95
- Corel Draw 4.0 Version Upgrade 216.95
- Harvard Graphics for Windows 2.0 ....82.95
- Lotus 123 Rel 4 Competitive/Vers 94.95
- Lotus Freelance for Win Comp Vers Upg 94.95
- Lotus Organizer Upgrade for Windows 34.95
- Lotus SmartSuite 2.1 for Windows Upg 284.95
- MS Bookshelf for Windows Upgrade 49.95
- MS Excel 5.0 for Window Competitive 121.95
- MS Office 4.0 for Windows Comp. Upg 274.95
- MS Powerpoint for Win Comp Upgrade 121.95
- MS Visual Basic Pro Version Upgrade 94.95
- MS Visual C++ Std Version Upgrade 76.95
- MS Windows 3.1 Upgrade 49.95
- MS Word 6.0 Competitive Upg for Win 119.95
- OS/2 Upgrade 114.95
- PC Tools Pro 9.0 Upgrade 46.95
- Qemm 7 Upgrade 39.95
- Stacker 3.1 Competitive 49.95
- WordPerfect 6.0 Comp Tradeup for DOS 117.95
- WordPerfect 6.0 Comp Tradeup for Win 114.95
- WordPerfect 6.0 Version Upg for DOS 6.0 99.95
- WordPerfect 6.0 Version Upgrade for Win. 99.95
- WordPerfect 6.0/Quattro Pro Comp Upgrd 141.95

P.O. Box 17882
Milw, WI 53217

- **One of Wisconsin's Top 10 Women OwnedBusinesses.**
- **Corporate, Government & School POs Welcome.**
- **No Surcharge on Credit Cards.**
- **Most Orders Shipped within 48 Hours.**
- **Software Shipping only $5 per order, not per title. Hardware: 5% - Min. $5.**
- **C.O.D orders welcome, with only a $6.00 Charge.**
- **We Ship Latest Version of Software Available.**
- **All Products Sold Carry Manufacturers' Full Warranties & Documentation.**
- **APO, FPO HI, AK Puerto Rico & Canadian orders welcome: 6% - Min. $6. International Orders Shipped First Class Mail Insured:15%- Min. $15. If mail cost exceeds calculated amount, you'll be billed additional.**
- **Call for Free Catalog & Items Not Listed**

Personal & company checks allow 14 working days to clear. Prices fluctuate beyond our control & may change for better or worse. Not responsible for typographical errors. Defective returns must have a Return Authorization number. Call our 1-800# to obtain a Return Authorization or your return will not be accepted. Shipping & handling are non-refundable. All sales are final. All returns are subject to a restocking fee.

* Free delivery applies only to the contiguous 48 states

Since 1982 ComputAbility *Consumer Electronics*

Exclusive CD ROM Bundles!*

CD ROM Drive & Interface Options	Bare Drive	8 Bit SCSI Interface	16 Bit SCSI-2 Interface	Pro Audio Spectrum 16	Pro Audio Studio 16	Sound Blaster SCSI-2	Sound Blaster ACSI-2 ASP	7 Title MPC Bundle
Chinon 535 Internal	$305	$349	$430	$475	$519	$499	$519	add $79
Chinon 535 External	$395	$425	$520	$585	$629	$609	$629	add $79
Mitsumi FX001D	$199 (with Sound Blaster 16 MPC = $358 or 16 MCD ASP = $394)							
NEC 3Xi Internal	$469	$529	$594	$639	$683	$683	$683	add $79
NEC 3Xe External	$559	$619	$684	$749	$793	$773	$793	add $79
Texel 3028i Internal	$295	$355	$420	$465	$509	$489	$509	add $79
Texel 5028e External	$399	$459	$524	$599	$633	$613	$633	add $79
Toshiba 3401B Internal	$355	$415	$480	$525	$569	$549	$569	add $79
Toshiba 3401E External	$459	$519	$584	$649	$693	$673	$693	add $79
Toshiba 4101 Internal New!	$235	$295	$360	$405	$449	$429	$449	add $79

*Prices good with the Purchase of any CD ROM Drive or Upgrade Kit (at time of purchase only)

"Add $79" Special 7 Title Bundle includes:

- Toolworks Multimedia Encyclopedia
- Chessmaster 3000
- Mavis Beacon Teaches Typing MPC
- US Atlas MPC
- World Atlas MPC
- Animals MPC
- Mario is Missing MPC

CIRCLE 300 ON READER SERVICE CARD

TECH INFO: (414) 357-8181 • FAX: 800-554-9981 • HRS (CST): M-F 8am-8pm, Sat 9am-5pm

LIGHTNING

In Windows-shattering competition, Comtrade's EISA Professional Machine stood head & shoulders above 191 others to win the coveted PC Magazine's Editors Choice award for Best Windows Workstation, December 7, 1993. This is the fourth time in recent months that lightning has struck at the same place – Comtrade. This same Comtrade system also won Computer Shopper's Best Buy, PC Sources Best Buy and Computer Buyer's Guide & Handbook Best Buy. Call Comtrade at 1.800.969.2123 and find out how you too can have the lightning speed and quality of a Comtrade System.

EISA Professional

- OverDrive Socket for **Pentium™** P24T Technology
- 256K Ultra Fast Cache SRAM
- **16MB** RAM & Expandable to 128MB
- One Floppy Drive (3.5" or 5.25")
- EISA **Bus-Master** SCSI-2 HD Controller
- **540MB** 10ms SCSI-2 Drive with 256K Cache
- VL-Bus **Diamond Viper** Graphics Accelerator with 2MB (Up to 1280x1024 & up to 16.7 million Colors)
- 15" Flat Screen .28mm Non-interlaced Color Monitor **(Low Radiation, 36% larger edge to edge display)**
- 2 Serial 1 Parallel & 1 Game Ports
- Enhanced 101-key Keyboard
- Hi-Resolution 400 DPI Serial Mouse
- Anti-Virus MS-DOS 6.2 & Windows 3.11
- Three-Year System & Lifetime Labor Warranty

486/66 DX2 $3095

P5/60 *PCI* $3795

- Multi-Session **CD-ROM** (280ms) Add $180
- 17" Flat Screen 1280x1024 Monitor Add $390

intel inside

STRIKES!

December 7, 1993™
Comtrade EISA VL-Bus Professional

VESA Local Bus Best Buy

- OverDrive Ready for **Pentium™** P24T Technology
- 128K Cache SRAM & Expandable to 256K
- **8MB** RAM & Expandable to 64MB
- One Floppy Drive (3.5" or 5.25")
- VESA Local Bus IDE Hard Disk Controller
- **420MB** 12ms IDE Drive with 128K Cache
- 32-Bit VL-Bus **ThunderPro** Graphics Accelerator with 1MB RAM (Up to 1280x1024 & up to 16.7Million colors) (Up to 40 Million Winmark 3.11)
- **15" Flat Screen .28mm Non-Interlaced Color Monitor (Low Radiation, 36% larger edge to edge display)**
- 2 Serial, 1 Parallel & 1 Game Ports
- Enhanced 101-key Keyboard
- Hi-Resolution 400 DPI Serial Mouse
- Anti-Virus MS-DOS 6.2 & Windows 3.1
- Three-Year System & Labor Warranty

486/33 DX $1795
486/66 DX2 $1995

- VL-Bus Diamond Viper Accelerator Add $220
- 17" Flat Screen 1280x1024 Monitor Add $390

VESA Local Bus WinXpress

- OverDrive Ready for **Pentium™** P24T Technology
- 128K Cache SRAM & Expandable to 256K
- **4MB** RAM & Expandable to 64MB
- One Floppy Drive (3.5" or 5.25")
- VESA Local Bus IDE Hard Disk Controller
- **420MB** 12ms IDE Drive with 64K Cache
- 32-Bit VL-Bus **ThunderPro** Graphics Accelerator with 1MB RAM (Up to 1280x1024 & up to 16.7Million Colors)
- 14" Non-Interlaced .28mm 1024x768 Color Monitor (2% larger edge to edge display)
- 9600/2400 Baud **FaxModem** With Fax Software
- 2 Serial, 1 Parallel & 1 Game Ports
- Enhanced 101-key Keyboard
- Hi-Resolution 400 DPI Serial Mouse
- Anti-Virus MS-DOS 6.2 & Windows 3.11
- Three-Year System & Labor Warranty

486/33 DX $1595
486/66 DX2 $1795

- Multi-Session **CD-ROM** (280ms) Add $180
- 15" Flat Screen & Low Radiation Monitor Add $100

1.800.969.2123

International 818.961.6688
FAX 818.369.1479
Tech Support 800.899.4508
24-Hour BBS Service 818.961.6098
Hours: 7:00-7:00 Pacific Mon-Fri
9:00-6:00 Pacific Sat

15314 East Valley Boulevard
City of Industry, California 91746

COMTRADE

"Where Quality is Everything"

CIRCLE 318 ON READER SERVICE CARD

create a DOS batch file, and use the Shell command to call up the batch file. In this example, the batch file would read

```
lpr c:\wptemp
del c:\wptemp
```

And assuming you've named the batch file WPPRN.BAT, the macro would read

```
{Shell}cwpprn{Enter}{Enter}
```

For this particular macro, since the point is to eliminate the need for a second step, you may want to include the print command, {Print}f, before the command to shell out to DOS. If you do this, you may want to add the line

```
{IF}{STATE}&1024~y{END IF}
```

after the {Print}f command. With some documents (including, for example, those with reference codes or Table of Contents codes that haven't been updated), WordPerfect will pause after the print command and display the prompt "Document may need to be generated. Print?" This particular IF statement uses `{STATE}&1024~` to see whether WordPerfect has paused to ask a Yes/No question. If WordPerfect is not waiting for an answer, the macro continues after the END IF. Otherwise, the line assumes that you will always want to continue printing and answers y. As an alternative, you may prefer to substitute {QUIT} for y. That way, if the macro detects a question, the macro will quit with the prompt still showing but without printing anything.

You'll also need to take WordPerfect's background printing into account. If you simply give the command to print, you'll find that the macro usually shells out to DOS long before WordPerfect finishes printing. To prevent that, you need to test to see if the printing is finished. Adding the following lines after the {Print}f command and the just-discussed IF statement will do the job:

```
{LABEL}Marktime~
{IF}{SYSTEM}print~&128~
{WAIT}30~
{GO}Marktime~
{END IF}
```

The `{SYSTEM}print~&128~` determines whether printing is finished. If it is, the macro goes past the {END IF} statement to the Shell command that should come immediately after. Otherwise, it waits three seconds, loops back to the label `Marktime`, and tests once again to see if printing has ended.

As always with WordPerfect macros, enter the commands that show in all caps by typing Ctrl-PgUp, then picking the commands from the pop-up list. Enter the commands in mixed case by typing the keystrokes directly—such as Shift-F7 for {Print}—or, for those commands such as {Enter} that give instructions to the macro editor, type Ctrl-V, followed by the keystroke. —*M. David Stone*

Spreadsheets

HIDING ROWS IN 1-2-3 FOR WINDOWS

❓ I thought that 1-2-3 for Windows, Release 4.0, had added the ability to hide rows (not just columns), but either it's not there or I can't find it. Please let me know if there is a way to do this.

Just in case the program really cannot hide rows, I wanted to pass along a tip for your readers. The old Release 2.0 trick of putting two vertical bars in the first cell on a blank row works in 1-2-3 for Windows! You can hide rows on the printout this way, even if you can't hide them on-screen.

Stephen J. Bier
New York, New York

▶PC MAGAZINE Notwithstanding its many other virtues, the latest revision of 1-2-3 still suffers from the inability to hide rows. You can reduce a row's height to 1 point, but not to 0. Reducing rows to 1 point is one way to bring widely separated worksheet rows into close proximity, but it has the drawback of leaving a black streak across the screen. If you're only interested in hiding rows on-screen, the approved method of viewing two portions of your worksheet at the same time is to use the View menu's Split command, which is analogous to the /Worksheet Window in Lotus's DOS spreadsheets.

Mr. Bier's vertical-bar technique is one way to suppress rows on printouts. To use it, simply type two piping symbols, ¦¦ (usually the shifted Backslash key), by themselves in a cell in column A. When printing, 1-2-3 will ignore all text on the row where your pipes appear. If there are no graphic objects on that row, the row itself will be suppressed, allowing you to bring separated rows together on the printout as though they were right next to each other on-screen. Note, however, that if you have embedded graphs on your piped rows, 1-2-3 will go ahead and print them! Also be aware that the piping symbols will not be visible in the cells where you type them. To see where they are, you'll need to scroll through column A and watch the formula bar. To avoid the hazard of having invisible piping symbols in your worksheet (which might give you fits later on when you want to print the entire sheet), it's a good idea to insert a new column A and put your piping symbols there. Afterward, you can simply delete this added column.

Notwithstanding its many other virtues, the latest revision of 1-2-3 still suffers from the inability to hide rows.

Another way you can suppress the printing of particular rows is to use the /Print commands on the Classic menu. Just as in 1-2-3, Release 3.*x*, when you use /Print Printer Go in 1-2-3 for Windows 4.0, 1-2-3 prints but does not eject the page. So if you want to print rows 1 through 10 followed immediately by rows 20 through 30, you can use /Print Printer Range, specify rows 1 through 10, and type G for Go. Then type R for Range, specify rows 20 through 30, and type G again. After you've done all that, you can type P to eject the page and press the Esc key to get out of the Classic-menu box.

Unfortunately, when you use /Print Printer Go, 1-2-3 ignores all font styling and embedded graphic objects. In other

Portable Power

The Pinnacle Tahoe™ Portable 3.5" Optical Drive

Introducing the world's smallest portable 3.5" optical drive with a rechargeable battery pack option that provides hours of portable computing.

The Pinnacle Tahoe-130 offers the ultimate in removability and transportability.

It provides portable storage for notebook computing and is the perfect choice for your desktop computer.

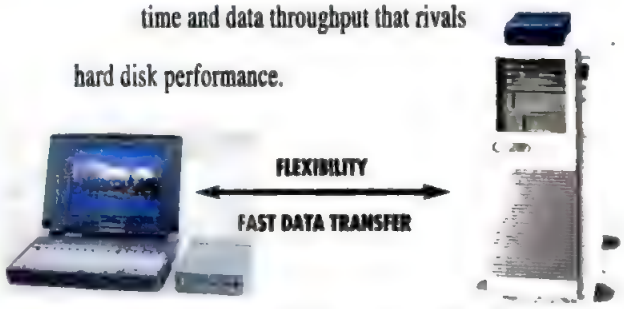
The Tahoe™ 128 MB optical drive weighs only 1.8 pounds and can fit in the palm of your hand.

It's small size is so flexible it can easily fit into any briefcase.

REWRITABLE OPTICAL DRIVE

The Tahoe™ is the perfect solution for users on the go, providing fast data transferring between your notebook and desktop computers. Simply connect the Tahoe™ to any **parallel port interface** and you are ready to go.

The Pinnacle Tahoe-130 has an ultra fast seek-time and data throughput that rivals hard disk performance.



The Tahoe's™ optional battery pack provides 3.5 hours of typical computer use, which will extend the run time of your portable computer by eliminating the use of your magnetic or floppy drive.

Lake Tahoe, Nevada

The portable Tahoe™ . . . only by Pinnacle. The optical storage leader.
To order a Tahoe™ to go call:

800.553.7070

CIRCLE 098 ON READER SERVICE CARD

PINNACLE MICRO

THE OPTICAL STORAGE COMPANY®

Trademarks. Tahoe and Tahoe-130 of Pinnacle Micro, Inc. All trademarks are registered marks to their respective owners.

19 Technology • Irvine, CA 92718 • U.S.A. • Int'l (714) 727-3300 • Fax (714) 727-1913

words, you get exactly the kind of printout in Release 4.0 that you would get from Release 3.*x* in text mode.

One final note while I'm on the subject of printing in 1-2-3 for Windows. Release 4.0, although a better Windows citizen than its predecessor, does not recognize the default printer as set in the Control Panel or Print Manager. If you use multiple printers, be aware that you must always choose the printer you want in the Printer Setup dialog box. Don't assume that choosing a new default printer elsewhere in Windows will tell 1-2-3 to use that printer.—*Craig Stinson*

Databases

RENAMING TABLES IN PARADOX

TIP In Paradox there is no need to use {Tools}{Copy} and {Tools}{Delete} to move a table to a new directory. Instead, you can move a table by choosing {Tools}{Rename} from the menu. When Paradox prompts for the name of the source table, choose the table to move. Then when Paradox asks for the name of the new table, enter the full path and table name of the new name of the table in the new location. Paradox will then move the table to its new directory.

Harry Goldman
Buffalo Grove, Illinois

▶**PC MAGAZINE** It's not completely obvious that you can use the {Tools}{Rename} menu option to move a table and its associated files to another directory. After all, it seems more logical that such an operation would be considered a move rather than a rename, which leads you to look for a Move menu option or settle for a Copy followed by a Delete.

According to the Paradox documentation, you can use {Tools}{Rename} to move a table and its associated files to a directory on another drive too. You'll find this shortcut useful for quickly renaming an Answer table after you've run a query, so you can save the query result. Otherwise, the Answer table will be overwritten by the result of your next query.
—*Sal Ricciardi*

Graphics

INCOMPATIBLE PRINTER EMULATIONS

? I own a Tandy Sensation computer and a Tandy DMP 240 printer. When I print color graphics from the Sensation's Winmate applications, I set up the printer as an Epson JX-80. But when I use that setting with Broderbund's Print Shop Deluxe, the printer skips every other line. If I choose any other emulation, the printer either doesn't print in color or doesn't print at all. The printout in Figure 2 demonstrates what happens with the Epson JX-80 setting compared with the normal Tandy DMP 240 setting. I've talked to Broderbund's technical-support people, but I still don't know what is wrong. Can you help?

Deanna Epps
Parker, Arizona

▶**PC MAGAZINE:** The printout in Figure 2 proves the old adage: One picture *is* worth a thousand words. If you scrutinize the two images, you'll see that Print Shop Deluxe is not actually skipping every other line when it uses the Epson JX-80 emulation. Instead, that color printout is elongated because an extra carriage return has been inserted between each line and the next.

Broderbund's technical-support staff had no trouble identifying the problem. In a nutshell: You're using the wrong printer emulation. In fact, extra carriage returns are a well-known artifact that appears whenever a 9-pin printer driver (such as the Epson JX-80) is used in conjunction with a 24-pin printer (such as the Tandy DMP 240). Print Shop Deluxe requires a 24-pin driver when printing to a 24-pin printer. So you must reconfigure the program to use the Epson LQ-2550 printer driver; the Epson LQ-2550 is a 24-pin color printer.

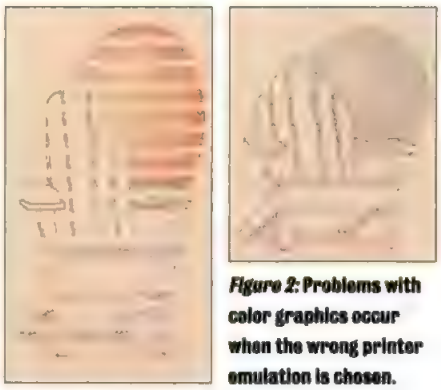


Figure 2: **Problems with color graphics occur when the wrong printer emulation is chosen.**

As you noted, though, choosing a new printer driver from within Print Shop Deluxe doesn't solve the problem—indeed, it seems to cause more serious difficulties. The fault lies not with Print Shop Deluxe, but with the menu program built into the DMP 240.

Whenever you work with Print Shop Deluxe, you must manually configure the printer to emulate an Epson LQ-2500/2550. This *should* be as simple as using the front-panel menu to switch from IBM to Epson modes—but it isn't. The Tandy DMP 240 allows you to save 4 different printer profiles, which are stored as macros and numbered sequentially 1 through 4. If you're using the default profile (or Macro 1), changing the emulation from IBM to Epson produces erratic results. Tandy's technical-support staff confirmed that this bug is the most likely cause of your printing problems and suggested the following workaround.

Using the front-panel menu, switch from Macro 1 to Macro 2. Then use the normal menu commands to specify Epson as the emulation mode. This is also a good time to check two other options in the menu. First, make sure you've indicated that the installed ribbon is a color ribbon. Second, check that you've turned the Auto Line Feed option OFF. Save this configuration as Macro 2. Now whenever you want to print a color image from Print Shop Deluxe, use the printer's front panel to switch between Macro 1—the IBM emulation—and Macro 2—the Epson emulation.—*Luisa Simone*

Languages

ACCESS THE WINDOWS CLIPBOARD FROM DOS BASIC

TIP I need a way to pass data between DOS and Windows applications. Although using a file appears to be the most direct way to do this, I wanted to avoid cluttering up the hard disk with temporary files that might not get deleted. The

COMPUTER DISCOUNT WAREHOUSE

WE COULDN'T HAVE DONE IT WITHOUT YOU.

WE'RE PROUD TO HAVE WON 4 COMPUTER SHOPPER BEST BUY AWARDS

IT CONFIRMS OUR BELIEF THAT THE CUSTOMER IS ALWAYS RIGHT! THANK YOU

CDW BEGINS 1994 BY OFFERING THESE "BEST BUYS"

US Robotics WorldPort 14,400 BPS Pocket Modems

✓ 14.4K BPS Data, V.32bis Protocol ✓ Fax Model Adds 14.4K BPS Send/Receive Fax ✓ V.42 Error Correction ✓ V.42bis Data Compression ✓ LED Status Indicators ✓ 9V Battery Powered, AC Adapter Included ✓ Complete Software Included ✓ While Supplies Last

14.4K Data ..... $149.00 CDW 27097

TOSHIBA

TOSHIBA T4600 i486SL/33 LCD NOTEBOOK

- 33 MHz i486SL Processor
- 4MB RAM Expandable to 20MB
- 120MB or 200MB Hard Drive
- 2 PCMCIA Slots
- 1.44MB Diskette Drive
- Pre-Installed Software: MS-DOS® V 6.0, Windows®
- **Free Case** (While Supplies Last)
- Ball Point™ with QuickPort™
- Weighs only 6.9 lbs

120MB ..... $2089.00 CDW 29539

CDW CIRCLE OF SERVICE™

AST Advantage! i486SX/25 Computer With SVGA Monitor

- i486SX/25, 2MB RAM
- 170MB Hard Drive
- MS-DOS V6.X, Windows V3.1, Mouse
- Magnavox .39mm SVGA 14" Monitor

CDW Price $1069.49 CDW 31945/29644

MICROSOFT MS-DOS V6.2

The Easy Way to Double Your Disk

◆ DoubleSpace Disk Compression ◆ ScanDisk Disk Diagnosis/Repair Utility ◆ DoubleGuard Data Protection

3.5" Upgrade ..... $46.50 CDW 32715

800 349-4CDW

©1994 CDW Computer Centers, Inc. PCM832

CIRCLE 159 ON READER SERVICE CARD

COMPUTER DISCOUNT WAREHOUSE™

MAGNAVOX CM9217 Magnascan 17" SVGA Monitor

● Maximum Display Resolution of 1280 x 1024 (Non-Interlaced) ● 72Hz Refresh Rate ● Horizontal Scan from 30 to 57 KHz ● Vertical Scan from 50 to 100 Hz ● 1 Year Limited Warranty ● Tilt & Swivel Base

BEST VALUE 17"

CDW® Price ....$599.50 CDW 23261

WHY PAY RETAIL?

CDW® Sells For Less

CANON BJC-600 Color Bubblejet Printer

✓ 360 dpi ✓ 240 cps
✓ Individual Color Cartridge System Less Waste
✓ 100 Sheet Feeder
✓ Laser Quality Text
✓ Optimized for Plain Paper Vibrant Colors Without Special Paper

CDW® Price ONLY $588.50 CDW 32009

HARDWARE, SOFTWARE & PERIPHERALS AT DISCOUNT PRICES

NETWORKING PRODUCTS

NOVELL

Netware V4.01

5 USER CD .... [illegible]
10 USER CD .... [illegible]
25 USER CD .... [illegible]
50 USER CD .... [illegible]

Netware V3.12

V3.12 5 USER 3.5" .... [illegible]
V3.12 10 USER 3.5" 1408.00
V3.12 25 USER 3.5" 2060.00
V3.12 50 USER 3.5" 2740.00
V3.12 100 USER 3.5" .... [illegible]

Call for Pricing on NetWare CD-ROM Versions and Upgrades

NETWARE LITE 1 USER .... [illegible]
NETWARE LITE STARTER KIT .... [illegible]
NE2000 PLUS ETHERNET COAX CARD 109.80
NE3200 THIN COAX w/TPA .... [illegible]
NE3200 THICK COAX 314.36

COACTIVE NEW

COACTIVE STARTER KIT .... [illegible]
COACTIVE ADD-ON KIT .... [illegible]

THOMAS-CONRAD

TC5143 ETHERNET COAX 122.87
TC5143 ETHERNET COAX 6PK 609.55
TC5143 ETHERNET 10BT 95.95
TC5143 ETHERNET 10BT 6PK 483.90
TC6242 ARCNET 8 BIT COAX CARD 69.59
TC6245 ARCNET COAX CARD 179.99
TC6242 ARCNET TP CARD 99.94
TC6245 ARCNET ALL IN ONE CARD 258.84
TC6040 ARCNET PASSIVE 4 PORT HUB COAX 39.50
TC6250 ARCNET ACTIVE 8 PORT HUB COAX 242.28
TC5050 ETHERNET 8 PORT CON 10BT 328.74
TC6151 ARCNET 16 PORT SMART HUB COAX 672.12
TC4035 TOKEN RING 4MBPS CARD 289.89
TC4045 TOKEN RING 16/4 CARD 359.44
TCNS 100MBPS COAX CARD 438.57
TCNS 100MBPS EISA COAX CARD 609.91
TCNS 100MBPS STP CARD 457.80
TCNS 100MBPS FIBER OPTIC CARD 718.00
TCNS 100MBPS 6 PORT SMART HUB COAX 1306.27
TCNS 100MBPS 8 PORT SMART HUB COAX 1148.47
TCNS 100MBPS 8 PORT SMART HUB STP 1160.78
TCNS 100MBPS 8 PORT SMART HUB FIBER 1468.80

ARTISOFT

AE3 ETHERNET COMBO CARD 198.96
NODERUNNER 2000A 217.34
NODERUNNER 2000T 176.47
NODERUNNER 2000C 176.47
NODERUNNER/SI 2000A 119.86
NODERUNNER/SI 2000T 95.44
NODERUNNER/SI 2000C 97.44
CENTRAL STATION II 389.89
10BT 5 PORT INTERNAL HUB 269.33
NODERUNNER STARTER KIT WINDOWS 499.57
LANTASTIC AI V5.0 .... 79.17
LANTASTIC AI V5.0 WINDOWS 79.19
LANTASTIC SOFTWARE 69.80
LANTASTIC FOR WINDOWS SW 129.68
T-RUNNER 8 PORT 10BT 299.88
T-RUNNER 12 PORT 10BT 497.41

SMC

ULTRA16 ETHERNET COAX 105.25
ULTRA16 ETHERNET COAX 6PK 583.68
ULTRA16 ETHERNET 10BT 105.25
ULTRA16 ETHERNET 10BT 6PK 583.68
ULTRA16 ETHERNET COMBO 125.35
ULTRA16 ETHERNET COMBO 6PK 693.49
ETHERCARD+ ELITE 8 BIT COAX 97.82
ETHERCARD+ ELITE COAX 119.64
ETHERCARD+ ELITE COAX 6PK 628.73
ETHERCARD+ ELITE MCA COAX 189.26
ETHERCARD+ ELITE 10BT 119.64
ETHERCARD+ ELITE 10BT 6PK 619.22
ETHERCARD+ ELITE MCA 10BT 189.55
ETHERCARD+ ELITE EISA 10BT 579.78
ETHERCARD+ ELITE COMBO 139.57
ETHERCARD+ ELITE COMBO 6PK 753.59
3608 ETHERNET 8 PORT CON 10BT 329.61
3612 ETHERNET 12+2 PORT CON 10BT 614.76
PC600WS ARCNET CARD COAX 125.93
PC650WS ARCNET CARD TP 119.86
PC600FS ARCNET CARD COAX 199.29
PC130 ARCNET CARD COAX 68.50
ARCNET 8 PORT ACTIVE HUB COAX 229.41
TOKENCARD ELITE 16/4 .... 289.88

NETWORKING PRODUCTS

3Com

3C503 ETHERLINK II COAX 159.84
3C509 ETHERLINK III COAX 119.50
3C509 ETHERLINK III COAX 5 PK 529.12
3C509 ETHERLINK III 10BT 119.50
3C509 ETHERLINK III 10BT 5 PK 537.97
3C509 ETHERLINK III MCA 10BT 242.45
3C529 ETHERLINK III MCA COAX 5PK 992.27
3C529 ETHERLINK III MCA 10BT 5PK 976.69
3C509 ETHERLINK III COMBO 135.88
3C509 ETHERLINK III COMBO 5 PK 578.84
3C579 ETHERLINK EISA COAX 229.91
3C579 ETHERLINK EISA 10BT 229.91
3C1627 12 PORT LINKBUILDER 10BT 628.97

Xircom

PE310BC POCKET ETHERNET COAX 314.80
PE310B2 POCKET ETHERNET COAX 260.00
PE310BT POCKET ETHERNET 10BT 268.31
PA202B6 POCKET ARCNET COAX 236.30
PT216BT POCKET TOKEN RING 16/4 .... 529.14
PT216B3 POCKET TOKEN RING 16/4 .... 527.08
PPX03 PARALLEL PORT MULTIPLEXOR 79.80
XIRCOM 14.4K POCKET MODEM 489.30

IBM TOKEN RING

IBM TOKEN RING 16/4 ISA 301.48
IBM TOKEN RING 16/4 MCA 699.95
IBM TOKEN RING MAU 458.88

intel

ETHEREXPRESS 16 COAX 99.33
ETHEREXPRESS 16 COAX 5PK 454.13
ETHEREXPRESS 16 COAX 20PK .... [illegible]
ETHEREXPRESS MCA COAX 166.52
ETHEREXPRESS 16 10BT 99.33
ETHEREXPRESS 16 10BT 5 PK .... [illegible]
ETHEREXPRESS 16 10BT 20PK 1698.38
ETHEREXPRESS MCA 10BT .... [illegible]
ETHEREXPRESS 16 COMBO .... [illegible]
ETHEREXPRESS 16 COMBO 5PK .... [illegible]
ETHEREXPRESS 16 COMBO 20PK .... [illegible]
ETHEREXPRESS FLASH 10BT .... [illegible]
ETHEREXPRESS FLASH 10BT 5PK .... [illegible]
ETHEREXPRESS FLASH COMBO .... [illegible]
ETHEREXPRESS FLASH COMBO 5 PK .... [illegible]
ETHEREXPRESS EISA COAX .... [illegible]
TOKENEXPRESS 16/4 .... [illegible]
NETPORT II COAX .... [illegible]
NETPORT II 10BT .... [illegible]
ETHEREXPRESS ISA HUB .... [illegible]
ETHEREXPRESS ISA HUB EXP .... [illegible]

TAPE, REMOVABLE & FLOPPY DRIVES

COLORADO MEMORY SYSTEMS INC.

JUMBO 120MB INTERNAL .... [illegible]
JUMBO 250MB INTERNAL 167.87
TRAKKER 120MB PARALLEL PORT 277.88
TRAKKER 250MB PARALLEL PORT .... [illegible]
POWERTAPE 2GB SCSI INTERNAL 947.87
POWERTAPE 2GB SCSI EXTERNAL .... [illegible]
POWERDAT 2GB SCSI INTERNAL .... [illegible]

IOMEGA

TAPE 250MB INSIDER HH .... [illegible]
FLOPTICAL 21MB INSIDER 379.27
BERNOULLI 90MB PC POWERED .... [illegible]
BERNOULLI 150MB INSIDER SCSI 428.11
BERNOULLI 150MB PC POWERED 478.06
BERNOULLI 150MB TRANSPORTABLE .... [illegible]
BERNOULLI 150MB INSIDER IDE .... [illegible]

SUMMIT

SE120 120MB INT TAPE B-U 138.96
SE250 250MB INT TAPE B-U 178.83
SE305 305MB INT TAPE B-U 269.90

MICROSOLUTIONS

BACKPACK 3.5" 1.44MB FLOPPY PARALLEL 177.84
BACKPACK 5.25" 1.2MB FLOPPY PARALLEL 177.84
BACKPACK 170MB HD PARALLEL 366.50
BACKPACK 200MB HD PARALLEL 427.59
BACKPACK CD-ROM PARALLEL 357.81
BACKPACK 250MB TAPE B-U PARALLEL 355.86

TAPE, REMOVABLE & FLOPPY DRIVES

SyDOS

PRO NOTE 42MB PARALLEL 488.17
PUMA 88MB PARALLEL 442.44
MARLIN 105MB INT IDE 498.26
88MB EXT SCSI W/ADPT 535.27

Mountain

TD-250 250MB INT IDE 189.32
FS8500 305MB INT IDE 449.50
SIDECAR II 305MB PARALLEL TBU 358.77
1200-4 4GB EXT SCSI 2019.93
750MB-1.5GB INT TBU W/ADPT 1036.19
750MB-1.5GB EXT TBU W/ADPT 1254.69

WYSE TERMINALS

WYSE 30 AMBER OR GREEN 272.00
WYSE 50 AMBER OR GREEN 365.98
WYSE 55 AMBER, GREEN, WHITE 358.46
WYSE 60 AMBER, GREEN, WHITE 279.60
WYSE 150 AMBER, GREEN, WHITE 265.45
WYSE 160 AMBER, GREEN, WHITE 329.88
WYSE 325 COLOR 519.49

MULTIMEDIA, SOUND, CD

ALTEC LANSING ACS300 SPKRS/SW 274.26
CDW 5 CD BUNDLE 129.17
CDW 5 CD BUSINESS BUNDLE 119.86
CDW 5 CD ENTERTAINMENT BUNDLE 79.33
CDW 4 CD EDUTAINMENT BUNDLE 85.16
CREATIVE LABS DISCOVERY 16 INT 439.81
CREATIVE LABS MULTIMEDIA STARTER INT 449.58
CREATIVE LABS SOUND BLASTER PRO 117.87
CREATIVE LABS SB 16 .... 175.46
CREATIVE LABS SOUND BLASTER 16 ASP 199.09
CREATIVE LABS SB 16 SCSI 187.56
MEDIAVISION PRO AUDIO 16 BASIC 116.36
MEDIAVISION PRO AUDIO SPECTRUM 16 .... 158.64
MEDIAVISION PRO AUDIO STUDIO 16 .... 214.30
MEDIAVISION PRO 16 SYSTEM II BUNDLE 847.97
MEDIAVISION MEMPHIS SYS 755.17
MS MULTIMEDIA BEETHOVEN 54.88
MICROSOFT BOOKSHELF CD 119.89
MICROSOFT WIN SND SYS V2.0 .... 52.95
MS WIN SND SYS V2.0 W/BOARD 139.77
MICROSOFT CINEMANIA 1994 .... 52.88
ORCHID SOUNDWAVE 32 .... 219.72
ORCHID GAMEWAVE 32 .... 149.90
PROCOM INT MULTIMEDIA STATION 739.16
PROCOM EXT MULTIMEDIA STATION 789.46
SONY DSKTOP LIBRARY INT 267.97
SONY DSKTOP LIB INT W/SND 459.05
SONY DSKTOP LIBRARY EXT W/SND 546.74
TURTLE BEACH MULTISOUND 513.97

CD-ROM & OPTICAL DRIVES

CHINON CDS535 INT CD-ROM KIT 388.45
CHINON CDX535 EXT CDROM KIT 449.90
ACCULOGIC PARALLEL PORT CD-ROM 499.50
HITACHI 1900S EXT CD-ROM 499.85
HITACHI CDR1950 EXT 512.50
HITACHI 6700 INT CD-ROM 409.86
HITACHI CDR6750 INT 412.51
NEC CDR74-1 EXTERNAL CD-ROM 399.50
NEC 3XI INTERNAL NEW 479.90
NEC 3XE EXTERNAL NEW 598.90
NEC 3Xp Portable 438.90
ORCHID CDS3110 INT 232.63
PIONEER DRM604X 6 DISC QUADRASPIN 1347.42
PROCOM 200MS INT SCSI CD-ROM 452.09
PROCOM 200MS EXT SCSI CD-ROM 557.66
SONY CDU535 INT CD-ROM 279.83
SONY CDU54101 INT SCSI CD-ROM 349.15
SONY CDU7205N EXT CD-ROM 463.19
SYDOS PARALLEL PORT CD-ROM 299.51
TEXEL 3028 240MS INT KIT .... CALL
TEXEL 3028 W/PA SPECTRUM 16 .... CALL
TEXEL 5028 240MS EXT KIT .... CALL
TEXEL 5028 W/PA SPECTRUM 16 .... CALL
TOSHIBA 3401 INT SCSI CD-ROM 397.97
TOSHIBA 3401 INT SCSI CD-ROM W/ADPT 549.14
TOSHIBA 3401 EXT SCSI CD-ROM 515.95
TOSHIBA 3401 EXT SCSI CD-ROM W/ADPT 649.55
TOSHIBA 3401 EXT SCSI 4 DRIVE TOWER 2535.06

PLOTTERS, DIGITIZERS & SCANNERS

KURTA

IS/ONE 12 X 12 4 BUTTON .... [illegible]
IS/ONE 12 X 12 12 BUTTON .... [illegible]
XLP 12 X 12 4 BUTTON & STYLUS .... [illegible]
XLP 12 X 18 16 BUTTON .... [illegible]
XGT 12 X 12 .... [illegible]

CalComp

DB III 12X12 W/STYLUS .... [illegible]
DB III 12X12 4 BUTTON 304.84
DB III 12X12 16 BUTTON 304.84
DB III 12X18 16 BUTTON .... [illegible]
DB III 12X18 16 BUTTON CORDLESS .... [illegible]
12 X 12 16 BUTTON .... [illegible]
24 X 36 16 BUTTON .... [illegible]

Summagraphics

SUMMASKETCH III 12 X 12 16 BUTTON 299.90
SUMMASKETCH III 18 X 12 4 BUTTON 524.44

HOUSTON INSTRUMENT

HI 7100 A-D SIZE 8 PEN 2598.78
HI 7200 A-F SIZE 8 PEN 3387.22

HEWLETT PACKARD

HP SCANJET IIP 739.48
HP SCANJET IIP DOCUMENT FEEDER .... [illegible]
HP SCANJET IICX W/ ISA NEW .... [illegible]
HP SCANJET IICX DOCUMENT FEEDER 474.72

EPSON

ACTIONSCANNER ES800C .... [illegible]
ES800C PARALLEL/SCSI 1089.81
ACTIONSCANNER ES800C 1077.28
ACTIONSCANNER ES800C PRO .... [illegible]

VIDEO PRODUCTS

VGA & SUPER VGA MONITORS

ACER SVGA 14" 239.09
AST VISION 4N 14" 369.91
AST VISION 4L 14" 399.95
IBM SVGA 14" 437.33
IBM 17P 17" 1043.71
MAG INNOVISION MX15F 517.97
MAG INNOVISION MX17F 899.50
MAGNAVOX CM2079 14" .39 .... 235.20
MAGNAVOX CM2089 14" .28 .... 275.90
MAGNAVOX CM2099 14" .28 NI 299.88
MAGNAVOX CM9217 17" 599.50
MAGANAVOX 20CM64 20" 1169.88
NANAO F340IW 15" 719.83
NANAO F550I 17" 1047.77
NANAO F550IW 17" 1199.00
NEC 3V 15" 519.29
NEC 3FGE 15" 589.39
NEC 4FGE 17" 722.72
NEC 5FGE 17" 1099.90
NEC 5FGp 17" 1358.59
NEC 6FGp 21" 2368.94
PANASONIC C1381I 14" 325.78
PHILIPS 1557AS 15" 479.89
PHILIPS 1764DC 17" 739.50
SONY CPD1430 14" 599.50
SONY CPD1730 17" 1049.15
SONY 17SE 17" NEW 1198.48

VGA & SUPER VGA DISPLAY CARDS

ACTIX ULTRA PLUS 1MB 235.90
ACTIX ULTRA PLUS 2MB 304.85
ADS VGA TO TV ELITE 259.69
ATI GRAPHICS ULTRA+ 2MB 237.97
ATI GRAPHICS ULTRA PRO 2MB 357.62
ATI GRAPHICS ULTRA PRO 2MB EISA 394.92
ATI VGA WONDER XL24 .... 119.32
CARDINAL WARPSPEED 2MB VLB 487.21
CREATIVE LABS VIDEO BLASTER 339.02
CREATIVE LABS VIDEO SPIGOT 337.97
DIAMOND STEALTH PRO 1MB 249.83
DIAMOND STEALTH PRO 2MB 336.61
DIAMOND SPEEDSTAR PRO 1MB 109.57
DIAMOND VIPER VLB 2MB 398.49
HERCULES GRAPHITE 1MB 229.72
HERCULES GRAPHITE 2MB 374.55
HERCULES DYNAMITE VLB 159.27
INTEL SMART VIDEO RECORDER 486.88
ORCHID FAHRENHEIT 1280+ 154.97
ORCHID FAHRENHEIT VA 177.97
ORCHID CELSIUS VLB 1MB 238.97
ORCHID CELSIUS VLB 2MB 299.79

If You Find a Better Price, Call CDW Before You Buy (800) 998-4CDW

NASDAQ
BUY WITH CONFIDENCE CDW® IS A NASDAQ TRADED COMPANY
TICKER SYMBOL CDWC
Duns 10-782-7952

No Surcharge For Credit Cards

CDW® HOURS
Sales 7:30-7:30 CDT Mon-Fri, 9:00-5:00 CDT Sat
Tech Support for Customers 8:00-7:00 CDT Mon-Fri, 9:00-5:00 CDT Sat

MOST ORDERS SHIP THE SAME DAY

COMPUTER DISCOUNT WAREHOUSE™

COMPUTER DISCOUNT WAREHOUSE™

CDW

AST Bravo LC I486SX/25 Desktop Computer

- ✓ I486SX/25 CPU
- ✓ 120MB HD, 4MB RAM
- ✓ Local Bus Video
- ✓ 4 16-bit Slots
- ✓ Midsize Case, 3 External Bays

CDW® Price ONLY $997.97 CDW 30837

WHY SETTLE FOR LESS?

CDW® SERVICES YOU BETTER

US Robotics Courier V.32terbo Modem

USRobotics

19,200 bps Without Compression

- ✓ Data Transfer Protocols from 2400 bps (V.22bis) to 19.2K bps (V.32terbo), Including Popular 9600 bps (V.32) and 14.4K bps (V.32bis) Compatibility.
- ✓ V.42, V.42bis Data Compression and Error Correction
- ✓ User-upgradeable to 28.8K bps (V.34) Technology when Available

Internal .... $330.60 CDW 32490

External ...... SPECIAL ..... $378.23 CDW 32480

CDW® CARRIES OVER 15,000 PRODUCTS. IF YOU DON'T SEE IT, CALL!

COMPUTERS

TOSHIBA

T1900/120MB	1499.00	T4600/120MB	2089.00
T1900/200MB	1669.00	T4600/200MB	2299.00
T1900C/120MB	2049.00	T4600C/120MB	3869.00
T1900C/200MB	2239.00	T4600C/200MB	3999.00
T1950/120MB	1899.00	T6600C/510MB	6099.00
[illegible]	[illegible]		

T1950CS/120MB PAS CLR ...... [illegible]
T1950CT/120MB ACT CLR ...... [illegible]
T1950CS/200MB PAS CLR ...... [illegible]
T1950CT/200MB ACT CLR ...... [illegible]
T1950CT/320MB ACT CLR ...... [illegible]
T3400/120MB NEW ...... [illegible]
T3400CT/120MB ACT CLR NEW ...... [illegible]
T4600C/340MB ...... [illegible]
T4700CS/200MB PAS CLR NEW ...... [illegible]
T4700CT/200MB ACT CLR NEW ...... [illegible]
T4700CS/320MB PAS CLR NEW ...... [illegible]
T4700CT/320MB ACT CLR NEW 4649.00

AST

LC 4/25S 120MB	[illegible]	LP 4/25S 340MB	1599.35
LC 4/33S 120MB	1119.97	LP 4/33D 170MB	1445.60
LC 4/33D 120MB	1267.97	LP 4/33D 340MB	1889.77
LC 4/33D 210MB	1497.97	LP 4/66D 170MB	1954.52
LC 4/50D 120MB	[illegible]	LP 4/66D 340MB	2394.91
LC 4/50D 210MB	1767.97	MT 4/33D 170MB	1497.97
LC 4/66D 120MB	1767.97	MT 4/33D 340MB	1936.44
LC 4/66D 210MB	2018.91	MT 4/66D 170MB	[illegible]018.15
LP 4/25S 170MB	1177.97	MT 4/66D 340MB	[illegible]467.97

NOTEBOOK 80MB MONO 1667.97
NOTEBOOK 120MB MONO/COLOR 1767.97/2449.97
NOTEBOOK 170MB MONO/COLOR ...... [illegible]/2527.97
NOTEBOOK 170MB COLOR+ 3297.97
POWEREXEC 4/25 200MB MONO SPECIAL ...... [illegible]
POWEREXEC 4/25 200MB COLOR SPECIAL ...... [illegible]

Canon

NOTEJET 4/25 135MB 2387.40
NOTEJET 4/25 180MB 2597.40
INNOVA 4/33L SX 170MB 933.93
INNOVA 4/33L SX 240MB 1025.71
INNOVA 4/50L 170MB 1365.86
INNOVA 4/50L 240MB 1445.96
INNOVA 4/66L 170MB 1538.57
INNOVA 4/66L 240MB ...... 1614.[illegible]

NEC

VERSA NOTEBOOKS

4/25 120MB COLOR	3589.26	4/40 120MB COLOR	3878.60
4/25 180MB MONO	2578.38	4/40 250MB MONO	[illegible]
4/25 180MB COLOR	3829.55	4/40 250MB COLOR	[illegible]
4/33 180MB MONO	2854.45	4/50 209MB MONO	[illegible]
4/33 180MB COLOR	4099.70	4/50 209MB COLOR	[illegible]
4/33 250MB MONO	[illegible]	4/50 340MB MONO	[illegible]
4/33 250MB COLOR	[illegible]	4/50 340MB COLOR	[illegible]4.69
[illegible] MONO	[illegible]		

READY ES 4/25 170MB ...... [illegible]
READY ES 4/33S 210MB ...... [illegible]
READY ES 4/66 250MB ...... [illegible]
READY 4/25S 170MB Multimedia ...... [illegible]
READY 4/33S 210MB Multimedia ...... [illegible]
POWERMATE ES 4/25 170MB ...... [illegible]
POWERMATE ES 4/33 170MB ...... [illegible]
POWERMATE ES 4/66 170MB 1699.93

SHARP

SHARP 486/33 200MB PAS CLR ...... [illegible]
SHARP 486/33 200MB ACT CLR ...... [illegible]

Texas Instruments

TM4000E 4/25D 120MB MONO 1859.55
TM4000 4/25D 200MB MONO ...... [illegible]
TM4000E 4/25S 120MB ADV COLOR ...... [illegible]
TM4000 4/40 200MB PASSIVE COLOR ...... [illegible]
TM4000 4/50 120MB MONO ...... [illegible]
TM4000E 4/50 200MB MONO ...... [illegible]
TM4000E 4/50 200MB DUAL COLOR ...... [illegible]
TM4000E 4/50 200MB ACTIVE COLOR ...... [illegible]

DOT MATRIX & LASER PRINTERS

OKIDATA

184 TURBO	218.14	ML590	424.51
ML320	[illegible]	ML591	585.87
ML321	[illegible]	PACEMARK 3410	1222.92
ML380	214.[illegible]	OL400E	499.96
ML395	[illegible]	OL810	905.50
ML395C	1038.74	OL830+	1079.95
ML520	[illegible]	OL850	1195.20
ML521	[illegible]	DOC-IT 4000	2909.49

Canon

BJ10SX NEW ...... [illegible]
BJ200 ...... [illegible]
BJ230 ...... [illegible]
BJC600 COLOR ...... [illegible]
LBP430 LASER ...... [illegible]

DOT MATRIX & LASER PRINTERS

EPSON

AP2250	118.[illegible]	LQ870	445.50
AP3250	173.18	LQ1170	615.55
AP3260	1[illegible].15	LQ2550	899.11
LX810	1[illegible].97	DFX5000	1357.97
FX870	[illegible]	DFX8000	2277.97
FX1170	[illegible]	STYLUS 300	229.96
LQ570+	[illegible]	STYLUS 800	278.48
LQ1070+	[illegible]		

ACTION LASER 1500 ...... [illegible]
ACTION LASER 1500 W/2MB ...... [illegible]

NEC

P3200	2[illegible].79	Silentwriter 95F	[illegible]
Jetmate 1000	27[illegible]	Silentwriter 95FX	[illegible]
SuperScript 610	[illegible]	SilentwriterR 1097	[illegible]
Silentwriter 640 NEW	7[illegible]		

Panasonic

1150	[illegible]	2180	[illegible]
1624	[illegible]	2624	[illegible]
1695	[illegible]	4410 LASER	[illegible]
2023	[illegible]	4430 LASER	[illegible]
2123	[illegible]	4440 LASER	11[illegible]
2124	[illegible]18.41		

Texas Instruments

MICROMARC INKJET ...... [illegible]
MICROWRITER BASIC ...... [illegible]
MICROWRITER PS35 ...... [illegible]
MICROWRITER PS65 ...... [illegible]
MICROLASER PRO 600 PS23 ...... 1376.[illegible]
MICROLASER PRO 600 PS65 ...... [illegible]
POWERSTEP UPG- mL600 ...... [illegible]

HEWLETT PACKARD

Deskjet Port 310	387.40	LaserJet 4L	689.97
Deskjet 500	319.89	LaserJet 4P NEW	999.99
Deskjet 500C	399.50	LaserJet 4MP NEW	1469.89
Deskjet 550C	598.12	LaserJet 4	1389.46
Deskjet 1200C	1399.88	LaserJet 4M	1948.64
Deskjet 1200C PS	1928.96	LaserJet 4SI	2968.95
HP Paintjet XL300	2249.39	LaserJet 4SI MX	4506.36

SHARP

SHARP JX9400 300DPI 4PPM ...... [illegible]
SHARP JX9460 600DPI 6PPM ...... [illegible]

IBM LEXMARK

4037 5E 5PPM 657.97
4029-10 10PPM 1117.97
4039-10R 10PPM 1347.97
4039-10RD 10PPM DUPLEX 1847.97
4039-12R 12PPM 1697.97
4039-12L 12PPM 2447.97
4039-16L 16PPM 2744.87

HARD DRIVES & CONTROLLERS

Maxtor

7131A 131MB IDE	1[illegible].10	7345A 345MB IDE	309.18
7245A 245MB IDE	[illegible]	7345S 345MB SCSI	365.63
7245S 245MB SCSI	[illegible]	7546A 540MB IDE	829.76

MICROPOLIS

1050MB IDE	[illegible]	1.050GB SCSI AV	[illegible]
1060MB SCSI	[illegible]	1.760GB SCSI AV	[illegible]
1.7GB SCSI	127[illegible]	1936 3GB SCSI	[illegible]

CONNER

210MB IDE	[illegible]	540MB IDE	[illegible]
343MB IDE	[illegible]	540MB SCSI	[illegible]
343MB SCSI	[illegible]	1GB SCSI	[illegible]
420MB IDE	[illegible]	1.37GB SCSI	[illegible]

Seagate

ST3243A 200MB IDE 225.75
ST3290A 261MB IDE 255.56
ST33990A 341MB IDE 322.50
ST3550A 452MB IDE 455.54
ST11200N 1.05GB SCSI 969.33

CONTROLLERS

ACCULOGIC IDE 23.86
ACCULOGIC IDE W/1PAR, 2SER, 1GAME 35.06
ACCULOGIC IDE W/BIOS 48.90
ACCULOGIC VLB IDE 96.76
ACCULOGIC ISA SCSI-2 ...... 119.44
ACCULOGIC EISA SCSI-2 ...... 349.88
ADAPTEC 1542CF SCSI KIT 259.45

MODEMS & COMMUNICATIONS

USRobotics

SPORTSTER MODEMS

14.4 INT ...... [illegible]
14.4 INT W/FAX ...... [illegible]
14.4 EXT ...... [illegible]
14.4 EXT W/FAX ...... 177.[illegible]
WORLDPORT 14.4 /W/FAX ...... [illegible]

COURIER MODEMS

V.32TERBO INT ...... [illegible]
V.32TERBO INT W/FAX ...... [illegible]
V.32TERBO EXT ...... [illegible]
V.32TERBO EXT W/FAX ...... [illegible]
16.8 HST EXT ...... 479.[illegible]
DUAL STD INT W/FAX ...... [illegible]
DUAL STD TERBO INT/EXT W/FAX ...... [illegible]

Hayes

ACCURA 2400B INT	[illegible]	OPTIMA 24 FAX	119.34
ACCURA 2400 EXT	[illegible]	OPTIMA [illegible]	[illegible]
ACCURA 24EC FAX	[illegible]	OPTIMA 96 FAX	354.42
ACCURA 96 FAX	[illegible]	OPTIMA 14.4 EXT	363.80
ACCURA 96 EXT	[illegible]	OPTIMA 14.4FAX	378.30
ACCURA 14.4 FAX	[illegible]	OPTIMA 14.4Pocket	[illegible]
ACCURA 14.4 EXT	[illegible]	ULTRA 9600 EXT	[illegible]
OPTIMA 2400	[illegible]	ULTRA 14.4 EXT	[illegible]

OPTIMA 28.8K V.FC EXT W/FAX NEW ...... 4[illegible].13
ESP ACCELERATED SINGLE/DUAL SERIAL 79.50 116.94

[illegible]

2400B INT 61.68
2400 EXT 69.95
PM2400EFX 2400 V.42 INT W/FAX 89.65
PM2400EF 2400 V.42 EXT W/FAX 109.55
PM2400FP 2400 POCKET W/FAX 109.55
PM9600FX 9600 INT W/FAX 174.30
PM9600FXMT 9600 EXT W/FAX 183.20
PM14400FX 14.4 INT W/FAX 185.20
PM14400FXMT 14.4 EXT W/FAX 197.28
PM14400FXSA 14.4 EXT W/FAX, LCD 374.45
PM14400FXP 14.4 POCKET W/FAX 339.96

intel

SATISFAXTION MODEMS

100 INT	98.66	350 INT	257.23
200 INT	209.50	400 INT	273.05
300 INT	229.70	400 EXT	309.59

2400 V.42BIS INT 109.70
2400 V.42BIS EXT 112.52
9600 INT/EXT W/FAX 154.76-165.26
14.4 INT/EXT W/FAX 168.46-197.26

BOCA

BOCA 14.4K INT W/FAX 119.56
BOCA 14.4K EXT W/FAX 149.86

BATTERY BACKUP AND UPS

BC250	99.11	BC900 LAN	359.67
BC400	145.77	BC1250 LAN	449.59
BC500	191.42	OMNI 500 LAN	269.31
BC500 LAN	199.40	OMNI 600 LAN	309.89
BC600 LAN	239.50	OMNI 750 LAN	399.86
BC750 LAN	313.90	OMNI 1250 LAN	599.03

OMNI 1600 LAN NEW 813.13
LAP POWER AC/DC INVERTER 59.23
POWERMISER 4 OUTLET NEW 49.50
ISOBAR 4 OUTLET 35.95
ISOBAR 6 OUTLET 46.36

AMERICAN POWER

BACK UPS 250	99.34	SMART UPS 400	299.95
BACK UPS 400	159.83	SMART UPS 600	363.36
BACK UPS 450	189.81	SMART UPS 900	569.55
BACK UPS 600	264.84	SMART UPS 1250	709.87
BACK UPS 900	374.14		
BACK UPS 1250	498.77		

SURGEARREST PLUS 29.97
SURGEARREST PLUS W/TEL ...... 54.[illegible]
LINE-R 600 ...... 119.09

MICE

LOGITECH DEXXA SERIAL MOUSE 27.37
LOGITECH MOUSEMAN COMBO 66.85
LOGITECH MOUSEMAN CORDLESS 89.93
LOGITECH TRACKMAN PORTABLE 72.50
LOG FOTOMAN+ W/FREE MOUSE 549.76
MICROSOFT MOUSE V2.0 SERIAL* 59.00
MICROSOFT MOUSE V2.0 PS/2* 59.00
MICROSOFT BALLPOINT V2.0 ...... 152.77
* SPECIAL [illegible]

PCMCIA

DATARACE PCMCIA 2400 W/FAX 178.70
DATARACE PCMCIA 14.4K W/FAX 248.24
DLINK PCMCIA ETHERNET 10BT 217.12
HAYES PCMCIA OPTIMA 9600 W/FAX 235.55
HAYES PCMCIA OPTIMA 14.4 W/FAX 339.00
IBM PCMCIA TOKEN RING 16/4 ...... 499.79
INTEL PCMCIA 2400 W/FAX 189.00
INTEL PCMCIA 9600 W/FAX 249.00
INTEL PCMCIA 14.4 W/FAX 299.00
LINKSYS PCMCIA ETHERNET COAX 197.91
LINKSYS PCMCIA ETHERNET 10BT 197.91
MEGAHERTZ PCMCIA 2400 W/FAX 189.95
MEGAHERTZ PCMCIA 2400 XJACK W/FAX 197.97
MEGAHERTZ PCMCIA 9600 W/FAX 259.90
MEGAHERTZ PCMCIA 9600 XJACK W/FAX 277.97
MEGAHERTZ PCMCIA 14.4 W/FAX 299.20
MEGAHERTZ PCMCIA 14.4 XJACK W/FAX 327.97
NOVELL/EAGLE PCMCIA ETHERNET COAX 242.80
PRACTICAL PCMCIA 14.4 W/FAX 319.00
T. CONRAD PCMCIA ETHERNET COAX 289.88
USR WORLDPORT PCMCIA 2400 W/FAX 284.60
USR WORLDPORT PCMCIA 14.4 W/FAX 308.48
XIRCOM PCMCIA ETHERNET COAX 276.80

MEMORY UPGRADES

CDW® Features Delkin, Kingston, Pacific Data and Simple Technology Memory.

AST BRAVO 486LC 2MB ...... CALL
AST POWEREXEC 486 4MB ...... CALL
AST PREMIUM II 1MB CUPID SIMM ...... CALL
AST PREMMIA 8MB UPG ...... CALL
COMPAQ DESKPRO 8MB ...... CALL
COMPAQ CONTURA 486 8MB ...... CALL
COMPAQ CONTURA 4MB ...... CALL
COMPAQ DP 386/16 4MB ...... CALL
COMPAQ LITE 4/25C 4MB ...... CALL
COMPAQ PROLINEA 486/33 4MB ...... CALL
COMPAQ PROSIGNIA 16MB ...... CALL
EPSON ACTION LASER 2-8MB ...... CALL
HP DESKJET 500 & 500C 256KB ...... CALL
HP LASER 4L 1MB MEM UPG ...... CALL
HP LASERJET 2P/III 2MB ...... CALL
HP LASERJET 3SI 4MB ...... CALL
HP LASERJET 4 4MB ...... CALL
HP PAINTJET XL300 4MB ...... CALL
IBM DESKTOPS-ALL MODELS ...... CALL
IBM THINKPAD 700 4MB ...... CALL
NEC SILENTWRITER 95 2MB ...... CALL
NEC VERSA 4MB ...... CALL
OKILASER 400 2MB ...... CALL
OKILASER 800 2MB ...... CALL
PANASONIC 4410, 4430 2-4MB ...... CALL
PANASONIC P4450I 2MB ...... CALL
TI MICROLASER 1MB ...... CALL
TI TM4000 4MB ...... CALL
TOSHIBA 1800, 1850, 2000SX/E, 2200SX 2MB ...... CALL
TOSHIBA 1800, 1850, 2000SX/E, 2200SX 4MB ...... CALL
TOSHIBA 1900C, 4500C, 4600C 8MB ...... CALL
TOSHIBA 4400, 4400SX/C 4MB ...... CALL
TOSHIBA T1800, 1850, 2000SX/E, 2200SX 8MB ...... CALL

Due to an Industry-Wide Memory Shortage, Please Call CDW for the Best, Most Current Pricing and Availability Information.

PROCESSOR/UPGRADES

CYRIX 486DRX/2 UPGRADE 299.29
INTEL OVERDRIVE 16/20MHZ 299.44
INTEL OVERDRIVE 25MHZ 367.20
INTEL OVERDRIVE 33MHZ 529.56
KINGSTON SX/NOW 25MHZ 169.45
KINGSTON SX/NOW 33MHZ 196.25
KINGSTON 486/NOW 25MHZ 328.76
KINGSTON 486/NOW 33MHZ 516.25

MATH COPROCESSORS

INTEL 287XL 84.80
INTEL 387SX 16/20/25MHZ 78.95
INTEL 387SX 33MHZ 91.20
INTEL 387SL 78.95
INTEL 387DX 84.95

COMPUTER DISCOUNT WAREHOUSE™

NEW! Lease Option Call for Details

CDW® Sells for Less and Services You Better!

(800) 998-4CDW

FAX (708) 291-1737

©1994 CDW® Computer Centers, Inc. PCM832

CALL FOR FREE CDW® CATALOG

COMPUTER DISCOUNT WAREHOUSE™

WHY PAY RETAIL? CDW™ Sells For Less !

TM4000E WinSX/25 Monochrome
Desktop-Feel 4mm Full-Travel Keyboard

TM4000E WinDX2/50 Color
Brilliant Dual Scan Color, i486DX2 Power

TM4000E WinSX/25 Color
Active Matrix Performance at a Passive- Matrix Cost

TEXAS INSTRUMENTS

Texas Instruments TravelMate Notebook Computers

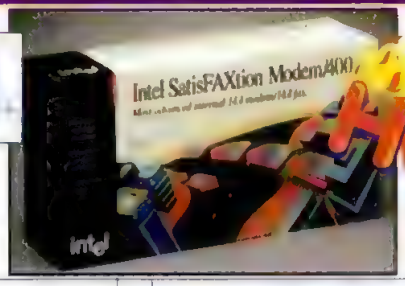
TEXAS INSTRUMENTS

Model	CPU	Hard Drive (MB)	RAM Std/Max (MB)	4mm Full-Travel Keyboard	Display	Pointing Device	Weight (lbs.)	CDW Price	CDW
Monochrome Notebooks									
TM4000	i486DX/25	200	4/20		10" Mono LCD, 64 Gray Scales	TravelPoint	5.6	$2269.44	24583
TM4000	i486DX2/50	120	4/20		10" Mono LCD, 64 Gray Scales	BallPoint	5.6	$2529.62	28973
TM4000E	i486DX/25	120	4/20	✔	10" Mono LCD, 64 Gray Scales	BallPoint	5.6	$1859.55	32070
TM4000E	i486DX2/50	200	4/20	✔	10" Mono LCD, 64 Gray Scales	BallPoint	5.6	$2699.78	32678
Color Notebooks									
TM4000	i486DX2/40	200	8/20		9.5" Passive Matrix Color	BallPoint	6.3	$2959.55	27285
TM4000E	i486SX/25	120	4/20	✔	8.2" Advanced Passive Matrix Color	BallPoint	6.2	$2099.43	31495
TM4000E	i486DX2/50	200	4/20	✔	8.2" Dual Scan Color	BallPoint	6.2	$3219.23	32679
TM4000E	i486DX2/50	200	4/20	✔	8.4" Active Matrix Color	BallPoint	6.2	$3779.16	29697

All TravelMate Notebooks Include Pre-Installed MS-DOS V6, Windows V3.1, and TI Utilities

INTEL FAX MODEMS — INTEL SatisFAXtion MODEMS

intel



	Intel Faxmodems							Intel SatisFaxtion Modems					
Model	14.4/14.4i	14.4/14.4e	96/96i	96/96e	24v/96i	24v/96e	24/96i	400	400E	350	300	200	100
Type	Internal	External	Internal	External	Internal	External	Internal	Internal	External	Internal	Internal	Internal	Internal
Data bps	14.4K	14.4K	9600	9600	2400	2400	2400	14.4K	14.4K	9600	14.4K	2400	2400
Data Protocol	V.32bis	V.32bis	V.32	V.32	V.22bis	V.22bis	V.22bis	V.32bis	V.32bis	V.32	V.32bis	V.22bis	V.22bis
Send Fax bps	14.4K	14.4K	9600	14.4K	9600	9600	9600	14.4K	9600	14.4K	9600	9600	9600
Receive Fax bps	14.4K	14.4K	9600	9600	9600	9600	4800	14.4K	9600	14.4K	9600	9600	4800
Error Correction (V.42, MNP 1-4)	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	✔
Data Compression (V.42bis, MNP 5)	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	
i80186 Fax Coprocessor								✔		✔		✔	
UART Buffering	✔		✔					✔		✔			
Scanner Interface								✔		✔		✔	
Smart Line Sharing								✔		✔		✔	
CDW™ Price	168.45	197.28	154.76	165.26	109.70	112.52	56.25	273.05	309.59	257.23	229.70	209.50	98.66
	CDW 30062	CDW 30061	CDW 30065	CDW 30064	CDW 32395	CDW 32396	CDW 32394	CDW 22330	CDW 22332	CDW 33105	CDW 26589	CDW 22322	CDW 22331

If You Find a Better Price, Call CDW™ Before You Buy!

CDW™ Sells for Less and Services You Better!

(800) 349-4CDW

PCM832

©1994 CDW™ Computer Centers, Inc

Extended Warranty Now Available

COMPUTER DISCOUNT WAREHOUSE™

COMPUTER DISCOUNT WAREHOUSE™

WHY PAY RETAIL? CDW® Sells For Less !

Industry-Leading Toshiba Portable Computers

T1900 / T1900C

T1950 / T1950CS / T1950CT

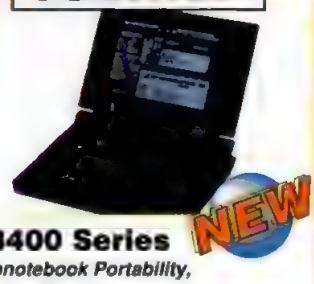
T4600/T4600C

T4700CS/T4700CT

Model	CPU	RAM (MB) STD/MAX	Display	PCMCIA Expansion	Weight Lbs.	Warranty (Years)	Hard Drive	CDW Price	CDW
T1900	i486SXA/20	4/20	9.5" 64 Gray Scale LCD	1) Type III	6.4	1	120MB	$1499.00	29355
							200MB	$1669.00	29536
T1900C	i486SXA/20	4/20	9.5" Dynamic STN Color	1) Type III	6.9	1	120MB	$2049.00	29537
							200MB	$2239.00	29538
T1950	i486DX2/40	4/20	9.5" 64 Gray Scale LCD	1) Type III	6.6	1	120MB	$1899.00	31928
							200MB	$2099.00	31929
T1950CS	i486DX2/40	4/20	9.5" Dynamic STN Color	1) Type III	6.9	1	120MB	$2479.00	31930
							200MB	$2699.00	31932
T1950CT	i486DX2/40	4/20	8.4" Active matrix Color	1) Type III	6.9	1	120MB	$2799.00	32042
							200MB	$2999.00	30243
							320MB	$3399.00	32044
T4600	i486SL/33	4/20	9.5" 64 Gray Scale LCD	1)IV or 2)II	6.5	SPECIAL	120MB	$2089.00	29539
							200MB	$2299.00	29540
T4600C	i486SL/33	4/20	9.5" Active Matrix Color	1)IV or 2) II	6.9	3	120MB	$3869.00	29541
							200MB	$3999.00	29542
							320MB	$4369.00	29543
T4700CS	i486DX2/50	8/24	9.5" Dynamic STN Color	1)II, 1)III	6.9	3	200MB	$3897.00	33645
							320MB	$4238.00	33646
T4700CT	i486DX2/50	8/24	9.5" Active matrix Color	1)II, 1)III	6.9	3	200MB	$4499.00	33642
							320MB	$4849.00	33644

All Toshiba Notebooks Are Bundled with MS-DOS, Windows 3.1, BallPoint Mouse with QuickPort and Toshiba Utilities Software

TOSHIBA



T3400 Series

Subnotebook Portability, Desktop Performance

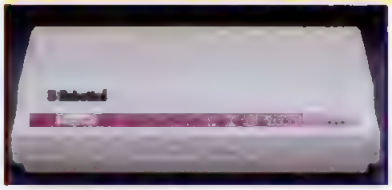
- Battery-saving SL-enhanced i486SX/33 CPU
- 4M RAM Std., 20MB Max.
- 120MB Hard Drive, 3.5" External Floppy Drive
- Monochrome: 8.4" STN-LCD, 64 Gray Scales
- Color: 7.8" TFT-LCD Active Matrix 256 Colors
- Local Bus Video for Optimal Windows Performance
- Serial, Parallel Ports, Optional Port Replicator
- PCMCIA Type II Slot
- Keyboard-integrated AccuPoint Pointing Device u120MB Hard Drive
- Bundled with MS-DOS, Windows, UltraFont and COMMWORKS for Windows
- 3 Year Warranty

T3400 MONO .....$2197.00 CDW 33634
T3400C COLOR .....$3428.00 CDW 33635

US Robotics Modems

US Robotics™

SPORTSTER 14.4: Performance



Now With WinFax Lite

● Features V.42/MNP 2-4 Error Control and V.42 bis/MNP 5 Data Compression for 57,600 bps Error-Free Throughput ● Internal Modems Include DCA Crosstalk ● Delrina WinFax Lite Included with Fax Models ● Backed with a Full 5 Year Parts and Labor Warranty ● Made in the USA

14.4K SPORTSTER
14.4 Fax Internal $149.50 28410

14.4K SPORTSTER
14.4 Fax External $177.50 28092

14.4K SPORTSTER
External $169.50 28305

14.4K SPORTSTER
Internal $139.50 28738

WORLDPORT
Pocket Modems

- V.32bis 14.4K bps
- 9V Battery Powered, AC Adapter Included

SPECIAL PURCHASE!

14.4K Pocket w/14.4K Fax ..... $169.00 CDW 26535
14.4K Pocket ..... $149.00 CDW 27097

ACT NOW! SUPPLIES ARE LIMITED!

Courier Upgradeable Modems

COURIER V.32terbo
The Cutting Edge of Data Communicatons Performance is Now Availble from US Robotics: V.32terbo is an Emerging Protocol, Providing 19.2K bps Data Transfer Rates *Without Compression.*
The Latest Technology is Available at CDW.

V.32terbo is *Here!* (19.2K bps)

COURIER MODEMS

Model	Data (bps) Protocol	Fax (bps)	V.42 V.42bis MNP 2-5	Type	CDW Price	CDW
HST	16.8K HST		✓	EXT	479.25	11539
V.32terbo	19.2K V.32terbo		✓	INT	333.60	32490
				EXT	378.23	32489
V.32terbo w/Fax	19.2K V.32terbo	14.4K	✓	INT	349.85	32492
				EXT	399.07	32491
Dual Standard V.32bis w/Fax	14.4K/16.8K V.32bis/HST	14.4K	✓	INT	652.63	23227
Dual Standard V.32terbo w/Fax	14.4K/19.2K V.32terbo HST	14.4K	✓	INT	679.01	32779
				EXT	732.63	32778

If You Find a Better Price, Call CDW® Before You Buy!

CDW® Sells for Less and Services You Better!

(800) 349-4CDW

PCM832

©1994 CDW® Computer Centers, Inc

FREE TECHNICAL SUPPORT FOR CDW® CUSTOMERS (708) 201-7575

COMPUTER DISCOUNT WAREHOUSE™

WINCLIP.BAS

```
'--- WINCLIP.BAS - Windows Clipboard Functions from DOS.

'Written by Harry F. Harrison,

DEFINT A-Z

DECLARE FUNCTION ClearClipboard% ()
DECLARE FUNCTION GetClipboardData$ ()
DECLARE FUNCTION GetClipboardDataSize% ()
DECLARE FUNCTION OpenClipboard% ()
DECLARE FUNCTION SetClipboardData% (Text$)
DECLARE SUB CloseClipboard ()

'$INCLUDE: 'QBX.BI'

CONST True = -1, False = 0
DIM SHARED Regs AS RegTypeX

'=== BEGIN DEMONSTRATION PORTION

IF LEN(ENVIRON$("windir")) = 0 THEN
  PRINT "Windows is not loaded!"
  END
END IF

IF NOT OpenClipboard% THEN
  PRINT "Unable to open the Windows Clipboard."
  END
END IF

Msg$ = "This is being passed through the Clipboard."
IF NOT SetClipboardData%(Msg$) THEN
  PRINT "Unable to send a message to the Clipboard."
END IF

CALL CloseClipboard              'close it for a moment
Dummy = OpenClipboard            'reopen to prove this works
NewMsg$ = GetClipboardData$      'get the message
CALL CloseClipboard              'close it for real this time
PRINT NewMsg$                    'and print the message

'=== END DEMONSTRATION PORTION

FUNCTION ClearClipboard%

  'This Function returns True (-1) if the Clipboard was cleared.
  'The Clipboard must be opened first.

  Regs.AX = &H1702
  CALL InterruptX(&H2F, Regs, Regs)
  IF Regs.AX <> 0 THEN ClearClipboard% = True

END FUNCTION

SUB CloseClipboard

  'This routine closes the Windows Clipboard. It is essential
  'that your application closes the Clipboard, or no other
  'application can get access to it.

  Regs.AX = &H1708
  CALL InterruptX(&H2F, Regs, Regs)

END SUB

FUNCTION GetClipboardData$

  'This routine gets the Windows Clipboard text, and returns it
  'in a string. The Clipboard must be opened first before it can
  'be accessed.

  'Before you can get the data, you must know how large the data
  'is, to allocate space for it in a BASIC string.

  Length = GetClipboardDataSize%
  IF Length% > 0 THEN            'There is data, get it
    Temp$ = STRING$(Length, 0)   'Allocate the space in BASIC
    Regs.AX = &H1705             'Set the function number
    Regs.DX = 1                  'Set the data selector to Text
    Regs.BX = SADD(Temp$)        'Show where to put the data
    Regs.ES = SSEG(Temp$)        'Use VARSEG with QuickBASIC
    CALL InterruptX(&H2F, Regs, Regs)
    IF Regs.AX THEN              'If present it's null-terminated
      Length = INSTR(Temp$, CHR$(0))
      IF Length THEN             'Return with the data
    GetClipboardData$ = LEFT$(Temp$, Length)
      END IF
    END IF
  END IF

END FUNCTION

FUNCTION GetClipboardDataSize%

  'The Clipboard stores text and graphics, so DX stores the data
  'selector. 1 = Text, 2 = Graphics. The length of the data is
  'returned in AX.

  Regs.AX = &H1704               'Get Clipboard Data Size
  Regs.DX = 1                    'We're considering Text
  CALL InterruptX(&H2F, Regs, Regs)
  GetClipboardDataSize% = Regs.AX

END FUNCTION

FUNCTION OpenClipboard%

  'This function opens the Clipboard for your VM (Virtual
  'Machine). Once you have opened the Clipboard, no other
  'application can access it.  You must close the Clipboard
  'when you are finished, to allow other applications to
  'access it.

  Regs.AX = &H1701               'Open Clipboard service
  CALL InterruptX(&H2F, Regs, Regs)
  IF Regs.AX THEN OpenClipboard% = True

END FUNCTION

FUNCTION SetClipboardData% (Text$)

  IF LEN(Text$) THEN
    IF ClearClipboard% = True THEN
      Regs.AX = &H1703           'Set Clipboard Data
      Regs.DX = 1                'Set the data selector to Text
      Regs.CX = LEN(Text$)       'Specify the data length
      Regs.BX = SADD(Text$)      'Show where the data is located
      Regs.ES = SSEG(Text$)      'Use VARSEG with QuickBASIC
      CALL InterruptX(&H2F, Regs, Regs)
      IF Regs.AX THEN SetClipboardData% = True
    END IF
  END IF

END FUNCTION
```

Figure 3: **These six routines let a DOS BASIC program access the Windows Clipboard.**

solution I devised is to pass text through the Clipboard. The Clipboard is a 32K area of memory that is set up by Windows when it starts, and Clipboard can be used by Windows programs to hold text and graphics data. However, Windows also provides services to DOS programs to access the Clipboard through the multiplex interrupt &H2F.

The six routines shown in Figure 3 use CALL INTERRUPT to invoke the multiplex interrupt, and they allow complete access to text in the Windows Clipboard. These routines let you open and close the Clipboard, clear it, and write and retrieve text data. By using Visual Basic's built-in Clipboard object, you can easily pass data between programs written in VB and DOS compiled BASIC.

Harry F. Harrison
Portland, Oregon

▶PC MAGAZINE: Many programmers are using both DOS compiled BASIC and Visual Basic, and these routines are sure to help. I added a small demonstration to show how they are used; you should remove the code between the identifying comments before adding this file as a module to your own programs.

These functions rely on the Interrupt routine that comes with BASIC in the form of two libraries. When running programs in the BASIC editor, you must load the appropriate Quick Library (having a .QLB extension) by starting BASIC with the /L switch. When linking to create a final program, you use the .LIB version of this library, which must be specified by name. For QuickBASIC 4.5, use QB.QLB and QB.LIB; for PDS use QBX.QLB and QBX.LIB; and for VB/DOS, the files are VBDOS.QLB and VBDOS.LIB. The name of the QBX.BI include file shown in WINCLIP.BAS must be changed to QB.BI for use with QuickBASIC, or VBDOS.BI for VB/DOS.—*Ethan Winer*

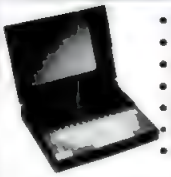
BEST PRICES IN TOWN! • (800) 831-8808

CALL FOR UPDATED PRICES

DEE ONE SYSTEMS MONTHLY SPECIALS

SYSTEM	MOTHERBOARD WITH CPU	[illegible]	BASIC SYS + 4MB HDD + 14" MONO & IDEP Card (80MB HDD ADD $60)	BASIC SYS + 4MB HDD + VGA CARD + VGA COLOR MONITOR (80MB HDD ADD $60)	BASIC SYS + 4MB HDD + SVGA CARD + SVGA COLOR MONITOR (120MB HDD ADD $20)	BASIC SYS W/4MB RAM 1.2 & 1.44 FDD + 120MB HDD + SVGA CARD + SVGA COLOR MONITOR (170MB HDD ADD $30)	BASIC SYS W/4MB RAM 1.2 & 1.44 FDD + 200MB HDD + SVGA CARD + SVGA COLOR MONITOR (200MB HDD ADD $20)	BASIC SYS W/4MB RAM 1.2 & 1.44 FDD + 340MB HDD + SVGA CARD + SVGA COLOR MONITOR (340MB HDD ADD $200)
[illegible]	$278	[illegible]	$638	$748	$818	$1,008	$1,058	$1,128
[illegible]	228	[illegible]	588	698	768	958	1,008	1,078
[illegible]	548	[illegible]	904	1,014	1,084	1,274	1,324	1,394
[illegible]	498	[illegible]	854	964	1,034	1,224	1,274	1,344
[illegible]	358	[illegible]	714	824	894	1,084	1,134	1,204
[illegible]	584	[illegible]	944	1,054	1,124	1,314	1,364	1,434
[illegible]	544	[illegible]	904	1,014	1,084	1,274	1,324	1,394
[illegible]	394	[illegible]	754	864	934	1,124	1,174	1,244
[illegible]	508	[illegible]	864	974	1,044	1,234	1,284	1,354
[illegible]	488	[illegible]	844	954	1,024	1,214	1,264	1,334
[illegible]	378	[illegible]	738	848	918	1,108	1,158	1,228
[illegible]	338	[illegible]	698	808	878	1,068	1,118	1,188
[illegible]	314	[illegible]	670	780	850	1,040	1,090	1,160
[illegible]	164	[illegible]	520	630	700	890	940	1,010
[illegible]	132	[illegible]	488	598	668	858	908	978
[illegible]	154	[illegible]	514	624	694	884	934	1,004
[illegible]	138	[illegible]	498	608	678	868	918	988
[illegible]	104	[illegible]	460	570	640	830	880	950
[illegible]	74	[illegible]	430	540	610	800	850	920
[illegible]	66	[illegible]	422	532	602	792	842	912

BEST PRICES IN THE WORLD



- 4MB RAM INSTALLED
- 120MB HARD DRIVE
- 1.44 FLOPPY DRIVE
- 1 SERIAL / 1 PARALLEL
- BUILT-IN TRACKBALL
- BATTERY PACK
- CARRYING CASE

Best Buy	Paper White Mono	Dual Scan Color	Active Matrix Color
486SX-25	$1,415	$2,065	$2,785
486SX-33	1,465	2,115	2,835
486DX-33	1,615	2,265	2,985
486DX2-50	1,665	2,315	3,035
486DX2-66	1,815	2,465	3,185

OPTIONS

- MS DOS 6.0 ..... Add $40
- Upgrade to 8MB RAM ..... Add $278
- Upgrade to 20MB RAM ..... Add $1,588
- 200MB Hard Drive ..... Add $148
- 340MB Hard Drive ..... Add $348
- Internal Battery Pak ..... Add $94
- Internal Fax Modem ..... Add $138
- Pocket Fax Modem ..... Add $118
- Docking Station ..... Add $368

BASIC SYSTEM CONFIGURATION: [illegible] & CPU [illegible] memory, IDE [illegible] controller w/[illegible] 1.44MB Floppy Drive, Internal Clock/Calendar, Enhanced Case with Power Supply, and 101 Key Enhanced Keyboard

LOCAL BUS STOP

486 Pentium VLB	$2,[illegible]	[illegible]	[illegible]
486SX2-50 VLB	[illegible]	[illegible]	[illegible]
486DX2-66 VLB	[illegible]	[illegible]	[illegible]
486DX-50/DX-33	[illegible]	[illegible]	[illegible]

- Local Bus Motherboard
- Local Bus SVGA Card w/1MB
- Intel Enhanced Loader
- 120MB IDE Hard Drive
- 4MB RAM
- 1.44MB Floppy Drive
- 1.44MB Floppy Drives
- 101 Key Enhanced Keyboard
- 14" Color Monitor (.28DP)
- VGA Card
- [illegible]
- Desktop or Mini Tower Case with [illegible]

NEW HARD DRIVES

40mb 28ms / 80mb17ms (IDE)...$104 / 146
130mb 15ms / 170mb17ms (IDE)..164 / 178
212mb 16ms / 250mb14ms(IDE)..194 / 214
340mb 15ms / 540mb12ms (IDE) .264 / 464
200mb 16ms (SCSI) 244
340mb 13ms (SCSI) 334
520mb 12ms (SCSI) 484
877mb 12ms (SCSI) 724
1.2GB 13ms (SCSI) 844
1.7GB 13ms (SCSI) 1,128

MATH COPROCESSORS

80287-10 ..... $40
387SX-33 / 25 ..... 50 / 48
387DX-40 / 33 ..... 54 / 52

PRINTERS

Citizen GSX-190 (9-Pin) $158
Citizen GSX-230 / 240 (24-Pin) ..... 248 / 298
Citizen GSX-145 (24-Pin) 378
Color Option for Citizen Printer ..... 46 / 66
Panasonic KX-P1150 / 2023 ..... 138 / 206
Panasonic KX-P2123 / 2124 ..... 246 / 326
Panasonic KX-P1624 / 2624 ..... 346 / 386

KEYBOARDS

101 Enhanced Keyboard $18
Maxiswitch / Keytronics ..... 28 / 30
MaxiPro II (124 Key Programmable) 54
Focus 2001 / 9000 ..... 36 / 56
Omnikey 101NI / 102 / Ultra ..... 66 / 68 / 98

VIDEO CARDS AND MONITORS

VGA-256K / 512K ..... $28 / 38
1MB SVGA Card (1024*768*256) 56
Windows Accelerators w/1MB 58
Cirrus Logic VLB w/1MB 86
Genoa 8500 VLB w/1MB 98
#9 Level 12 (ISA / VLB) 428
ATI Graphic Ultra w/Mouse 158
ATI Graphic Ultra Plus w/2MB 226
ATI Graphic Ultra Pro w/2MB 320
ATI Graphic Ultra Pro VLB w/2MB 324
Diamond Speed Star Pro VLB / ISA 106
Diamond Stealth 24VLB w/1MB 146
Diamond Viper VLB w/2MB 374
Orchid Fahrenheit 1280+ w/1MB 144
Orchid Fahrenheit VLB w/1MB 144
Orchid Celsius VLB: 1MB / 2MB ..... 204 / 274
MAG 15F (15") / 17F (17") ..... 494 / 870
Nanao F340iw / F550iw ..... 594 / 1,108
Nanao T560i / T660i ..... 1,656 / 2,398
NEC 3FGe / 4FGe / 5FGe ..... 586 / 676 / 1,084
Sony 1430 / 1604 / 1730 ..... 578 / 928 / 974
Viewsonic 4E / 6E / 7 ..... 264 / 284 / 814
Viewsonic 15E / 15 ..... 394 / 464
Viewsonic 17 / 20 ..... 974 / 1,680
Hitachi CM-2095 (20") 1,294
14" VGA (640*480, 0.51) 170
14" Super VGA (1024*768, 0.39) 194
14" Super VGA (1024*768, 0.28) 230
14" Super VGA (1024*768, 0.28) NI 244
15" Super VGA (1280*1024, 0.28) 334
17" Super VGA (1280*1024, 0.28) 594

CD ROM / MULTIMEDIA

Creative Labs Sound Blaster $58
Creative Sound Blaster Pro Deluxe 110
Mediavision Pro Audio Spectrum 16 138
Mitsumi or SONY CD-ROM 150
Chinon CDS535 (SCSI) Internal 324
Toshiba XM-3401B 200ms (SCSI) 356
Trantor (SCSI) Host with Driver 58
Creative Discovery CD16 Upgrade Kit 416
Creative Edutainment CD16 Upgrade Kit 466
Speakers System 10

HARD/FLOPPY DRIVE ADAPTERS

IDE 2FD/2HD Cache Controller $95
Vesa Local Bus IDE 31
Adaptec SCSI 1542CFK w/Kit (ISA) 235
Adaptec SCSI 1742 (EISA) 335
Bustek SCSI 742A (EISA) 275

MISCELLANEOUS

2400 Modem (w/9600 Send Fax) 29
Fax Modem (9600 Fax, 2400 Modem) 40
Fax Modem (14,400 Fax, 14,400 Modem) 114
3-Button Mouse 9
Logitech Mouseman Serial / Bus ..... 58 / 62
Microsoft Mouse Serial / Bus ..... 36 / 58
Conner Tape Backup 250MB 126
Colorado Tape Backup DJ-10/20 ..... 104 / 160
Colorado Trakker JT-20 (250MB) Ext 338
16 Bit Ethernet Card Coax/10 Base T 48

VISA

MasterCard

Dee One Systems

To Order Call

800-831-8808

- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]

For Printers, It's Arlington!

Arlington Computer Products appreciates your interest in our products!

EPSON®

FX870	$259	LQ1170	$589
FX1170	$345	LQ2550	$879
LQ570+	$235	DFX5000	$1299
LQ870	$425	DFX8000	$2189
LQ1070+	$355	Action 3250	$169

Action Laser 1000 ..... $579
Action Laser 1500 ..... $639
Action Laser 1500-2MG ... $689
Stylus 300 ..... $239
Stylus 800 ..... $279

■ **ACTION NOTE 486 DX/2**
- **120 MG Drive**
- **4 MG RAM**
- **Fax Modem $1619.00**

■ **ACTION LASER 1500**
- **6 PPM**
- **27 Fonts**
- **PCL5 Compatible**
- **PC Computing — "Best PCL5"**

Byte Magazine "Best Buy!"

■ **STYLUS 800**
- **Inkjet at 360 DPI**
- **7 Scalable Built-In Fonts**

When you've got an Epson, you've got a lot of company.™

CHIPS

1MB/4MB Simms .... $49/$159
Epson Action 2 MG $99
Cyrix 486 DX/2 ..... $289
HP 4MG Upgrade $159
OKI Laser 2MB $125

intel.

80387 SX or SL $75
80387-16/20/25/33 ..... $85
Overdrive SX20/25 .. $285/$339
Overdrive DX25/33 .. $339/$495

TEXAS INST.

486/WINSX 120 ..... $1835
486/WINSX 25 Color $2119
486/DX2/50-200 MG $2639
486/DX2/40 Color $2889
486/DX2/50E Color $3749
MicroWriter Basic $519
MicroWriter PS23 ..... $675
MicroWriter PS65 ..... $935
Pro 600 PS23 ..... $1329

SOFTWARE

Aldus Pagemaker 5.0..... $519
Corel Draw 4.0 ..... $359
Lotus 123 2.4/3.4 ... $279/$349
Microsoft Office $449
Microsoft Windows 3.1 .... $69
Microsoft DOS 6.0 Upg. ... $59
Word Perfect 6.0 ..... $249
Word Perfect Windows ... $269

Arlington Computer Products, inc.

DRIVES & TAPES

Back Pack 250..... $349
Connor 250 Tape $149
Connor 120/170 .... $179/$199
Connor 212/540 .... $239/$639
Teac Dual Floppy $119
Toshiba 3½" 1.44 ..... $69

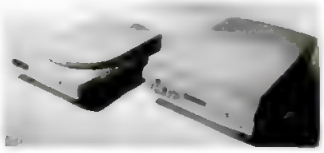
COLORADO

Colorado Jumbo 120..... $119
Colorado Jumbo 250..... $165
Colorado Trakker 120 .... $275
Colorado Trakker 250 .... $315
Colorado 2GB Ext..... $1069
Qic 80 Tapes $21

AMERICAN UPS

250	$99	600	$259
400	$155	900	$369
450	$185	1250	$485

CD ROM



NEC - TRIPLE SPEED

NEC 3Xe $549
NEC 3Xi..... $459
NEC 4X Pro $899
Fusion Double CD $499
Mitsumi Int. $169
NEC Multispin 38 ..... $249

SEAGATE HARD DISKS

40 MB for AT (ST251-1) .. $229
120 MG 3144A $175
245 MG 3283 ..... $279
260 MG 3290A $225
452 MG 3550A $409

HEWLETT-PACKARD

Laserjet IV w/Toner $1369
Laserjet IVP w/Toner..... $989
Laserjet IVMP w/Toner .. $1379
Laserjet IVL w/Toner..... $675
Laserjet IVML/w/Toner .. $1039
Laserjet IVM w/Toner ... $1929
Laserjet IV SI w/Toner .. $2989
Laserjet IV SI MX $4499
Jet Direct 2371A $399
Jet Direct 2371B $449
1MG Upgrade $69
2MG Upgrade $99
4MG Upgrade $159
8MG Upgrade $339
Deskjet 500/500C $309/409
Deskjet 550C $575
Deskjet 1200C $1369
2P Scanner..... $719
IIC Scanner $979
Deskjet 1200C/PS..... $1939
Pacific Page/XL..... $259/$699
Pacific Data 25 in 1 Font . $239

NETWORKING

Netware 3.12 5 User $579
Netware 3.12 10 User ... $1269
Netware 3.12 25 User ... $1729
Netware 3.12 50 User ... $2279
Netware 3.12 100 User .. $3249
Netware 4.0 10 User $1959
Netware 4.0 25 User $2899
Lantastic Starter 5.0..... $429
Node Runner 2000C $175
Central Station $385
E143 Ethernet $185
NE2000 ..... $119
SMC Hub 8 Port T/P $325
SMC Hub 8 Port Coax ... $225
SMC TP 12 node Conc... $579
SMC+16-6 Pack..... $619
SMC Ethercard +/+16 $89/$115
3 Com EtherLink II..... $179
3 Com Etherlink III..... $119
Etherlink III 5 Pack $529
Intel Ether 16 ..... $89
Intel Ether 16-5 Pack..... $429
Intel Ether 16-20 Pack... $1629
Intel Ether EISA 32 ..... $509
Intel Token 16/S $389
Xircom Pocket Ethernet .. $269
Xircom PCMCIA Ethernet $279

OKIDATA

ML320 ..... $295
ML321 ..... $415
ML380 ..... $209
ML520 ..... $369
ML521 ..... $489
ML590 ..... $415
ML591 ..... $569
ML395 ..... $959
ML395C $1029
PM3410 ..... $1199

OL400E $495
OL410E $699
OL810..... $899
OL830..... $1089
OL850+ $1199
Okidata Laser 2 MG..... $125

Panasonic Office Automation

1124I	$229	2624	$369
2023	$199	3123	$279
2123	$229	4410	$535
2124	$295	4430	$639
2180	$169	4440	$1149
1624	$379	4455	$1659

4410/4450I 2 MG...$129

NEC

Jetmate 1000 ..... $269
P6200/P6300 ..... $399/$599
P9300 ..... $825
Superscript 610..... $635
Model 95/95FX .... $869/$1079
Model 1097 ..... $1349

SCAN. & DIGIT.

Epson Action Scanning .. $779
Logitech ScanMan 256... $169
Color ScanMan $439
ScanMan w/Omni Page .. $185
Summasketch 12×12 ..... $255
Summasketch 12×18 ..... $499

FOR ORDERS & QUOTES:

800-548-5105

Canon

NEW TECHNOLOGY!

BJ-10SX $239
BJ-200 .....$255*
BJ-230 .....$389
BJ-330 .....$489
BJC-600C $579
BJC-800 .....$1449
BJC-820 .....$1579
LBP-430 .....$579
LBP-8SX $979

*After $30.00 Rebate 12/31/93

■ **BJ-200 - 360 DPI - 4 PPM**

■ **NOTEJET 486 - SLC/25**
- **Built-In "Bubble-Jet" printer**
- **4 MG Ram**

85 MG - $2139 135 MG - $2349
180 MG - $2549

■ **NOTEBOOK 486 - SLC/25**
- **120 MB • Fax Modem**
- **4 MG..... $1575.00**
- **As Above with Dual STN Color $2198**

Canon has "Bubble-Jet" Technology!

intel Modems

Along with connecting you to an audience of millions, Intel Fax Modems provide outstanding value.

Fax Modems

24/96 Int.	$58.00	96/96 Int.	$139.00	14.4/14.4 Int.	$149.00
24/96 Ext.	$119.00	96/96 Ext.	$159.00	14.4/14.4 Ext.	$169.00

SatisFAXtion MODEMS

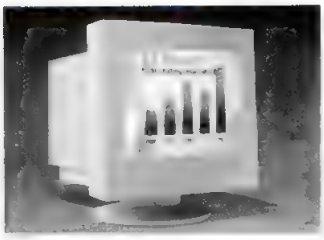
200 2400 V.42/9600 Fax	$199.00	400 14.4/14.4 Fax	$259.00
300 14.4/9600 Fax	$219.00	400 Ext. 14.4/9600Fax	$295.00

PC MCIA MODEMS

Take your office with you wherever you go. The Intel PCMCIA Fax-modem is a credit card-sized adapter that inserts into a computer's PCMCIA slot.

24/96 .....$179.00
14.4/14.4 .....$279.00

MONITORS



NEC

3 FGE/3 V $579/499
4 FGE $679
5 FG/5 FGP $1245/1339
5 FGE $1049
6 FG/6 FGP $2249/2299

CTX

5468A/1451 ..... $249/$279
1560/1760 ..... $379/$719

MAG

MX15F 15" $495
MX17F 17" $879

MITSUBISHI

EGA $239
Diamond Scan 4533C $349
Diamond Pro 17 ..... $1019
Diamond Scan 15 FS..... $479
Diamond Pro 21 FS $2149
HL6955 20" $1759

NANAO

F340IW $689
F550I/550IW ..... $995/$1159
T560I/560IW ..... $1675/$1399
T760IW $2099

PANASONIC

1381 VGA 1024×768..... $319
1991 VGA 1280×1024.... $1539

VIEW SONIC

15/17-7..... $429/$799
20/21..... $1679/$1879

MODEMS

Hayes

Hayes Accura 14.4/Fax... $199
Hayes Optima 96 ..... $309
Hayes Optima 96 Fax $339
Hayes Optima 14.4/Fax .. $369
Hayes 28.8 ..... $425
Hayes Ultra 96 14.4 ..... $589
Hayes Pocket 14.4 ..... $299
PCMCIA 14.4 ..... $269

PRACTICAL PERIPHERALS

Practical Per. 9600 Int. ... $169
Practical Per. 9600 Ext.... $179
Practical Per. 14.4 Int..... $185
Practical Per. 14.4 Ext. ... $195
Practical Per. 14.4 Pocket $319
Practical Per. FaxMe $119
PCMCIA 14.4 ..... $295

U.S.Robotics

16.8 HST Ext..... $459
14.4 Dual Std. 16.8..... $659
Sportster 14.4 Int..... $145
Sportster 14.4 Ext. $159
Sportster 14.4 Int. Fax.... $149
Sportster 14.4 Ext. Fax ... $169
Courier V.32 Terbo Fax .. $389
PCMCIA 14.4 ..... $295

VIDEO BOARDS

ATI VGA Wonder 1MG ... $119
ATI Graph Ultra+ 1MG ... $199
ATI Graph Ultra + 2MG .. $209
ATI Graph Prof 2 MG $329
Boca Super VGA $99
Diamond Stealth Pro..... $239
Diamond Viper 2 MG..... $389
1024 VGA 16 Bit $59

CIRCLE 336 ON READER SERVICE CARD

ARLINGTON COMPUTER PRODUCTS... GREAT SERVICE SINCE 1984!

- **PC Magazine "...Arlington offers worry-free mail order purchasing!"**
- **PC Sources Review "...You can be confident that what you order will work!"**
- **PC Computing "...Courteous service and terrific technical support!"**
- **PC Computing Mail Order Review of Peripheral Specialists 8/93. We received the only 5 Star Rating for Price!**

Prices and availability subject to change without notice. Qualified purchase orders accepted.

CIRCLE 336 ON READER SERVICE CARD

Hours C.S.T.
7:30-8:30 pm Mon-Fri
9:00-5:00 pm Saturday

1970 Carboy.
Mt. Prospect, IL 60056

NO SURCHARGE FOR CHARGE CARDS!

CUSTOMER SERVICE AND IN ILLINOIS
708-228-6333
SHIPPING
708-228-9748
TECHNICAL ASSISTANCE
708-228-1470
FAX
708-228-0516

Arlington Computer Products, inc.

FOR ORDERS & QUOTES:

800-548-5105

expotech

A VTECH COMPANY

Versatile...portable... powerful and priced right! expo NOTE 486slc33

Versatile...removable hard drive. Use different hard drives for a variety of uses and you can interchange hard drives with other people. A flexibility of information use you never had before

Portable...weighs less than 7lbs. and fits in your briefcase.

Powerful...4Mb Ram, 120 Meg running at 33 Mhz. As much power as most desktops.

Priced right...just $1299

Your dependable supplier!

Expotech is one of the fastest growing computer companies in the U.S.A. (over 1 million systems sold) For over 10 years we have given the best value, the best support systems and the best service. Our research laboratories are consistently developing the latest and best technology for the lowest cost.

The customer comes first...

We have toll free customer support, a toll free FAX line and support via Prodigy.

Also, we can ship same day (with most systems) after credit approval. You can depend on Expotech

Call today...open 7 days a week

Central Standard Time

Monday - Friday 7am - 8:30pm
Saturday 9am - 6pm Sunday 10am - 3pm

expo NOTE 486slc33

- Weighs less than 7lbs.
- Only 2.1"(H) x 11.4"(W) x 9.25"(D) Fits comfortably in a briefcase
- 4 Mb RAM, 120 Meg Hard Drive
- 640x480 VGA screen with 64 levels of grey plus concurrent VGA external monitor port
- External keyboard port
- Multi I/O (2 serial, 1 parallel)
- 1.44 Meg Floppy
- MS-DOS 6.0, Windows 3.1, Mouse
- Complete power management functions
- Dual voltage A/C adapter included

REMOVABLE HARD DRIVE

- 2400/9600 FAX MODEM BUILT IN

JUST $1299 386sx/33 $1199 *Modem not included in 386 SX/33*

1.800.284.3976 *in Canada 1.800 685 8284*

Software, Modem & Service Package for Desktop & Tower Systems Only. All Prices, Availability, and Specifications subject to change without notice. Please call to confirm pricing, IL Sales Tax, Availability, and Warranty Details.

CIRCLE 003 ON READER SERVICE CARD

expotech

800 North Church Street
Lake Zurich, IL 60047

1.800.284.EXPO

FAX 1.800.947.EXPO

GOVERNMENT & EDUCATION 1.800.947.0461

CANADA 1.800.685.8284

HIT THE TRAIL WITH A WINNER.

TravelMate 4000E WinSX™/25 COLOR

$2,099
TEXTMS25CE

Lease as low as $105/Mo.

- 486SX 25MHz CPU
- 640 x 480 VGA 8.2" Color Display
- 256 Colors Simultaneously
- Pre-installed Windows 3.1™ and MS DOS®
- 4MB RAM, expandable to 20MB
- 120MB Hard Disk Drive
- MS BallPoint® with QuickPort™ Connection

TEXAS INSTRUMENTS

TravelMate 4000E WinDX2™/50 Dual Scan COLOR

$3,219
TEXTMD250D

Lease as low as $149/Mo.

- 486DX2 50MHz CPU
- Dual Scan Color Display
- Pre-installed Windows 3.1™ and MS DOS®
- 4MB RAM, expandable to 20MB
- 200MB Hard Disk Drive
- MS Ball Point® with QuickPort™ Connection

TravelMate 4000E WinDX2™/50 COLOR

$3,799
TEXTMD250C

Lease as low as $182/Mo.

- 486DX2 50MHz CPU
- 8.4" Active Matrix Display
- Pre-installed Windows 3.1™ and MS DOS®
- 4MB RAM, expandable to 20MB
- 200MB Hard Disk Drive
- MS Ball Point® with QuickPort™ Connection

TravelMate 4000 WinDX2™/40 COLOR

- 486DX2 40MHz CPU
- 640 x 480 VGA 9.4" Color Display
- 256 Colors Simultaneously
- Pre-installed Windows 3.1 and MS DOS
- 8MB RAM, expandable to 20MB
- 200MB Hard Disk Drive
- MS BallPoint® with QuickPort™ Connection

$2,899
TEXTMD240C

Lease as low as $143/Mo

"It's a quality desktop replacement...most powerful portable we've seen. One of the lightest units in the entire test group."
PC Magazine, March '93

"...in our battery tests, the TI 4000 WinDX2/50 achieved a magnificent 6 hours and 24 minutes."
Portable Computing, April/May '93

"TI has done more to customize and optimize Windows than the other notebook vendors."
Windows Magazine, February '93

TravelMate 4000E WinDX2™/50

- 486DX2 50MHz CPU
- 640 x 480 VGA 10" Display, 64 gray scales
- Pre-installed Windows 3.1™ and MS DOS
- 4MB RAM, expandable to 20MB
- 200MB Hard Disk Drive
- MS BallPoint® with QuickPort™ Connection

$2,649
TEXTMD250E
Lease as low as $131/Mo

TravelMate 4000E WinSX™/25

- 486SX 25MHz Processor
- 640 x 480 VGA 10" Display, 64 gray scales
- Pre-installed Windows 3.1™ and MS DOS®
- 4MB RAM, expandable to 20MB
- 120MB Hard Disk Drive
- TravelPoint™ pointing device

$1,839
TEXTMS25E

Lease as low as $92/Mo.

Insight

800-927-3167

TravelMate, BatteryPro, WinSX, WinDX and TravelPoint are trademarks of Texas Instruments Inc. MS-DOS and BallPoint are registered trademarks, and Windows, Advanced Power Management and QuickPort are trademarks of Microsoft Corp. Lease figures based on 24-month F.M.V. lease and include freight. Sales tax not included. Leases are non-cancelable and may require a deposit. Worry-Free Guarantee may have some restrictions for notebooks. Shipping is non-refundable.

TravelMate 4000 WinDX™/25

- 486DX 25MHz CPU
- 640 x 480 VGA 10" Display, 64 gray scales
- Pre-installed Windows 3.1™ and MS DOS®
- 4MB RAM, expandable to 20MB
- 120MB or 200MB Hard Disk Drive
- TravelPoint™ pointing device

$1,999 120MB
TEXTMD251

$2,129 200MB
TEXTMD252

Lease as low as $108/Mo

SIMPLY THE LOWEST PRICES ON PENTIUM!™

EXPERTS' Windows SOURCES PICK

Winner of *Windows Sources* Expert's Pick *Windows Sources* May 1993

"Expandable system, fast disk – a Good Buy"
Windows Sources June 1993

Insight VESA® Local Bus™ Computers

Insight 486 VL

Fully Upgradable Intel 80486 CPU
2 VESA VL-Bus™ Compatible Slots
4MB RAM - 128K Cache
340MB 12ms IDE Hard Drive
32 Bit VL-Bus™ Compatible IDE Controller
32 Bit VL-Bus™ Compatible 1MB Graphics Accelerator Super VGA Card
15" Non-Interlaced SVGA Color Monitor
1.2MB 5.25" Floppy Drive
1.44MB 3.5" Floppy Drive
2 Serial Ports, 1 Parallel Port
Enhanced 101 Key Keyboard - Mouse
MS-DOS 6.2 - Windows 3.1
Desktop Case standard, Full Tower or Mid-Tower Available

33MHz-486DX Insight 486 VL

$1,699

Lease as low as $90/mo.

33MHz 486SX.....$1,559
50MHz 486DX2.....$1,759
66MHz 486DX2.....$1,859

Insight VL/EISA

Fully Upgradable Intel 80486 CPU
Two VESA® VL-Bus™ Compatible Slots
8MB RAM - 256K Cache
1000MB 12ms Hard Drive w/cache EISA HDD Controller
14" N I Super VGA Color Monitor
24 Bit 1MB Graphics Accel. SVGA Video Card
1.2MB 5.25" and 1.44MB 3.5" Floppy Drives
2 Serial & 1 Parallel Port
Enhanced 101 Key Keyboard- Mouse
MS-DOS 6.2 - Windows 3.1
Ultimate Tower Case

66MHz-486DX2 Insight VL/EISA

$2,999

Lease as low as $138/mo.

33MHz 486DX.....$2,799

intel inside

PCI P60 CD

Intel 60MHz PENTIUM™ Processor
New PCI interface motherboard
273 pin zif socket
2 PCI, 4 ISA, 1 PCI/ISA Slots
16MB RAM, 256K Cache
540MB 12ms HDD w/cache
15" NI SVGA Monitor & PCI ATI Video Card
1.44MB 3.5" Floppy Drive
1 Bi-directional Parallel, 2 Serial ports
Enhanced 101 Key Kbd. - Mouse
MS-DOS 6.2, Windows for Workgroups
Full Tower Case

PLUS: 320ms, double-speed, CD-ROM drive with Toolworks MM Encyclopedia, Adventures, Fractals and National Parks Guide MPC CD's

Insight PCI P60 CD

$3,599

Lease as low as $165/mo.

SUPER PCI P60 CD

Intel 60MHz PENTIUM™ Processor
New PCI interface motherboard
273 pin zif socket
2 PCI, 4 ISA, 1 PCI/ISA Slots
32MB RAM, 256K Cache
1 GIG 12ms HDD w/cache
17" NI SVGA Monitor & PCI ATI Video Card
1.44MB 3.5" Floppy Drive
1 Bi-directional Parallel, 2 Serial ports
Enhanced 101 Key Kbd. - Mouse
MS-DOS 6.2, Windows for Workgroups
Full Tower Case

PLUS: 320ms, double-speed, CD-ROM drive with Toolworks MM Encyclopedia, Adventures, Fractals and National Parks Guide MPC CD's

Super PCI P60 CD

$4,799

Lease as low as $218/mo.

20,000 PRODUCTS 24 HOURS A DAY.

NETWORKING

3Com

Etherlink II 16 bit 3C5Ø3	$154
16 bit Ethernet Card 3C507	279
Etherlink III 10 Base-T 3C5Ø9	132
Etherlink III Coax 3C5Ø9	128
Etherlink III Combo 3C5Ø9	139
Etherlink III 4/16 10 pack 3C619	3,999
Etherlink III 32 bit 10 Base-T 3C579	229

ARTISOFT Revolutionizing Connectivity

AE-2* Ethernet Starter Kit DOS	$479
AE-2 Ethernet Starter Kit Windows	569
AE-3* Ethernet Starter Kit DOS	549
AE-3 Ethernet Starter Kit Windows	599
LANtastic/AI (single node)	89
LANtastic/AI (up to 300 users)	1,499
LANtastic Win Network Utility	169
LANtastic for NetWare Netwk Oper Sys	289
ArtiCom Modem Sharing software	239
A2Mbps Starter Kit DOS	349
A2Mbps Starter Kit Windows	399
Extra AE-2 Boards	199
Extra AE-3 Boards	239
NodeRunner 2000/c	189

intel

Intel Ether Express 16	$99
Intel Ether Express 16 5 pack	449
Intel Ether Express 16 coax	119
Intel Ether Express 16 10 Base-T	99
Intel Ether Express Flash Combo	129
Intel Tokenexpress 16/4 LAN	399

Microsoft

Windows for Workgroups	$189
Windows for Workgroups MLP	129
Windows for Workgroups Starter Kit	589
Windows for Workgroups User Kit	269

SMC Ethernet

LANEPRE Ethercard + 8 Bit	$99
LANEP16E Ethercard + 16 Bit	139
LANEP32 Ethercard + 32 Bit	799
LANET16 Ethercard + 16 Bit 10BT	119

Thomas Conrad

Ethernet Adapter TC5043-T	$149
Ethernet Adapter TC5043-2	159
Ethernet Adapter/AT TC5045-T	259
4Mbps Token Ring Adapter TC4035	319
16/4Mbps Token Ring Adapter/AT TC4046	369

Xircom Simply Expanding Connectivity

ET16BU Ext. Token Ring	$679
EE10BU Ext. Ethernet Adapter	439
PA2-0286 Int. (Arcnet)	249
[illegible] Ext. 16/4 TR DB-9	549
Classic Ext. Par. Ether LAN Adapt.	149

MEMORY/SIMM

1MB x 9 80ns	$Call
1 MB x 9 70ns	Call
256KB x 9 70ns	Call
4MB x 9 70ns	Call
512 x 36 2MB	Call
1 x 36 4MB	Call
2 x 36 8MB	Call
4 x 36 16MB	Call

PCMCIA CARDS

Megahertz

[illegible] bps [illegible]	[illegible]
14.4/14.4 bps MEXU1144	429

Intel Fax/Modem 2400/9600 bps	289
Intel Fax/Modem 9600/9600 bps	379
Intel Fax/Modem 14.4/14.4 bps	459
Xircom Network combo	339
Xircom Network RJ-45	299
Xircom Netwrok BNC	299
US Robotics Fax/Mdm 14.4/14.4 bps	440
US Robotics Fax/Mdm 2400/9600 bps	309
Talon Network 10BT NWTA1ØBT	289
Talon Network 10B2 NWTA1ØB2	299

INPUT DEVICES

Digitus Ergonomic Mouse	$49
Logitech Mouse Man serial	79
Logitech Mouse Man bus	79
Logitech TrackMan Portable	95
Logitech ScanMan 256	289
Logitech ScanMan 256 w/ Catchword	319
Logitech Foto Man	549
Kurta XLP 12"x12" Digitizer	239

NOTEBOOK COMPUTERS

TOSHIBA

T1900 486SX-20MHz, 4MB RAM (expandable to [illegible]) PCMCIA Slot, 9.5" Display

120MB, [illegible] Matrix Color	$2,059
200MB, [illegible] Matrix Color	2,299
120MB, Monochrome	1,499
200MB, Monochrome	1,699

T1950 486DX2-40MHz, 4MB RAM (expandable to 20MB) PCMCIA Slot, 9.5" Display

120MB, Monochrome	$1,879
200MB, Monochrome	2,089
120MB, Color	2,479
200MB, Color	2,679

T4600 486SL-33MHz, 4MB RAM (expandable to 20MB), 2 PCMCIA Slots, 9.5" Display

120MB, Active Matrix Color	$3,829
200MB, Active Matrix Color	3,999
340MB, Active Matrix Color	4,349
120MB, Monochrome	2,599
200MB, Monochrome	2,749

T6600 Laptop 486DX2-66MHz, 8MB RAM

6600C 510MB Color	$6,099
6600C/CD 510MB Color	6,899
6600C/CDV 510MB Color	7,599

NEW Toshiba Protege - less than 5 lbs! 33MHz SL enhanced 486SX, 4MB/120MB Type II PCMCIA, external floppy drive

T3400CT Active Matrix	$3,449
T3400 Monochrome	2,199

PRINTERS

Canon

BJ-10SX CNBJ1ØSXW	$249
BJ-200 Bubble Jet CNBJ200K	299
BJ-230 CNBJ23Ø	399
BJC-600 Color CNBJC6ØØK	599
BJC-820 (SCSI) CNBJC82Ø	1,499
LASER LBP 430 CNLBP43Ø	569
LBP 8SX CNLBP8SX	989

CITIZEN Printers

GSX-240 CTGSX24Ø	$294
GSX-240 Color Option CTCOLOR	49
Wide Carriage CTGSX145	369
GSX-145 Color Option CTCOLOR145	59

Epson

Epson AP3250	$174
Epson LX-810	169
Epson FX-870	274
Epson LQ-570+	239
Epson LQ-1070+	359
Epson LQ-870	439
Epson LQ-860 Color	574
Epson LQ-1170	589
Epson LQ-2550 Color	679
Epson DFX-5000	1,319
Epson DFX-8000	2,199

HP Printers

HP DeskJet 310 MAHPDJ31Ø	$299
HP DeskJet w/Cut Sheet Feeder	359
HP DeskJet Color Kit	39
HP DeskJet Accessories	Call

IBM by Lexmark

2380 MALEX238Ø	$319
2381 MALEX2381	449
2390 MALX239Ø	329
2391 MALEX2391	449
4029020 Laser 6 MALEX4Ø29	969
4029030 Laser 10 MALEX1ØL	1,129
4037 5E Laser	659

NEC

P32ØØ 24 Pin NCMDL32ØØ	$229
P62ØØ 24 Pin NCMDL62ØØ	424
Silentwriter 1Ø97 NCMDL1Ø97	1,429

OKIDATA

OL4ØØE Laser	$619
OL41ØE Laser	525
OL81Ø Laser	929
OL85Ø Laser	1,239
ML38Ø Dot Matrix	219
ML59Ø Dot Matrix	419
ML184 Dot Matrix	229
ML32Ø Dot Matrix	299
ML321 Dot Matrix	419
ML395 Dot Matrix	966
ML395C Dot Matrix	1,019
ML52Ø Dot Matrix	365
ML521 Dot Matrix	489
ML591 Dot Matrix	567
OL 83Ø+ Dot Matrix	1,079

Panasonic Office Automation

KX-P441Ø Laser	$589
KX-P443Ø Laser	699
KX-P444Ø Laser	1,149
KX-P445Ø Laser	949
KX-P2Ø23 Dot Matrix	198
KX-P2123 Dot Matrix	235
KX-P2124 Dot Matrix	315
KX-P2624 Dot Matrix	369
KX-P3123 Dot Matrix	289
KX-P3124 Dot Matrix	349
KX-P3624 Dot Matrix	409

star

NX-245Ø 24 Pin Color	$249
LS-5EX Laser	749
SJ-144 Color Laser	459
SJ-48+ Ink Jet	279

MODEMS

intel

Intel Internal 14.4 modem	$199
Intel SatisFAXtion 100	99
Intel SatisFAXtion 200	225
Intel SatisFAXtion 300	245
Intel SatisFAXtion 350	369
Intel SatisFAXtion 400	289
Intel SatisFAXtion 400e	329

Hayes

Hayes Ultra 96 Modem	$589
Hayes Ultra 144 Modem	659
Hayes Optima 24+ Fax 96	159
Hayes Optima 96/SC EZ	349
Hayes Optima 144/SC EZ	439

PRACTICAL PERIPHERALS

PractiCARD PCMCIA	$419
PM14400FXMT Ext. V.32bis	239
PM14400FX PKT Pocket V.42bis	Call
PM14400FX Internal V.42bis	219
PM14400FXSA External LCD	389
PM14400FX Internal d/f	219
PM9600FXMT External	229
PM9600FX Internal	209
PM2400EFXSA external	129
PM2400EFX Internal	99

NOTEBOOK COMPUTERS

COMPAQ

Concerto 4/25 4MB/250MB Mono	$2,699
Concerto 4/33 4MB/250MB Mono	2,899
Contura 4/25 4MB/209MB Color	2,879
Contura 4/25 4MB/120MB Color	2,579

NEC

Ultralite Versa

486 SL-25 Mono. 120MB HD	$2,799
486 SL-25 Mono. 180MB HD	2,999
486 SL 25 Color 120MB HD	3,799
486 SL 25 Color 180MB HD	4,099
486 SL-33 Mono. 180MB HD	3,249
486 SL-33 Color 180MB HD	4,299

BRAND NAME COMPUTERS

COMPAQ

Prolient 1000 Server 486DX2-66	$5,799
Prolinea 4/25s 4MB/240MB wt	1,129
Prolinea All-In-One 4/25 sx 200MB	1,399

Double speed!

CD-ROM DRIVES

CHINON

Model CDS535
Bare .... 369 Kit 429

NEC

Model 84
Bare .... $399 Kit $479

Talon

Talon DS-100 320ms/300KB	$249
Talon DS-200 245ms/330KB	369

TEAC

Bare .... $339 Kit $409

PLEXTOR

Model DM-3028
Internal bare .... $299 Kit $369
External bare 389 w/controller .479

TOSHIBA

Model 3401
Bare .... $429 Kit $499

MULTIMEDIA

CREATIVE

Sound Blaster Pro Deluxe	$125
Discovery CD 8 Internal Kit	395
Discovery CD 16 Internal Kit	465
Edutainment CD 16 Internal Kit	539
Sound Blaster 16 ASP	209
Sound Blaster MIDI Kit	59
Video Blaster	349
Video Spigot for Windows	469

MEDIA VISION

Fusion Double CD 16 System	$839
Pro AudioSpectrum 16 SoundCard	169

REVEAL

MultimediaFX - 02	$399
MultimediaFX - 04	479
MultimediaFX - 06	599

Talon

TA-2000DS Multimedia kit	$599

SOFTWARE

The lowest prices on thousands of titles.

MONITORS

ADI

MicroScan 2E 14" CM5514B	$315
MicroScan 3E+ 14" CM5514E	379
MicroScan 3E 14" CM5514A	340
MicroScan 3G 14" CM5514G	399
MicroScan 5A 17" CM5517	899

iiyama

15" 1024x768, NI, .28 dp, MRP II	$399
17" 1280x1024, NI, .28 dp, MPRII	699
20" 1280x1024, NI, .28 dp,	1,299

NEC

15" MultiSync 3FGe CMNEC3FGe	$639
15" MultiSync 4FGe CMNEC4FGe	749
17" MultiSync 5FGe CMNEC5FGE	1,069
21" MultiSync 6FG CMNEC6FG	2,359

TAPE BACKUPS

COLORADO MEMORY SYSTEMS

250MB COJUMBO25Ø	$189
120MB COJUMBO	89
Trakker 250MB COJT20	329
Trakker 120MB COJT1Ø	299

CONNER

TapeStor 250MB Internal A25Ø	$139
TapeStor 250MB Ext. Par A25ØEP	399

EXABYTE The Capacity to Succeed

8mm 5.0Gig Model 85Ø5	$2,599
8mm 2.2Gig Model 82Ø5	1,699
8mm Tape Cartridge	16.95

IOMEGA

Iomega Tape250 Insider Internal	$189
Iomega Tape250 Insider Half-height	189
Iomega Tape250 PC Powered Ext.	319

Talon 250MB Internal

w/2 unformatted tapes TBTA250IK	$179
w/5 formatted tapes TBTA25ØIK5	229

WangDAT

4mm DAT 2GB Int. 16 Bit Kit	$999
4mm DAT 4GB 3200 Int 16 Bit Kit	1,199
4mm DAT 4GB 3200 Ext 16 Bit Kit	1,299

PRINTERS

TEXAS INSTRUMENTS

PC MAGAZINE EDITORS' CHOICE

TI microWriter™ PS23 Printer TEX1Ø23 .... **$679**

5ppm, 14 HP LJ II fonts, Postscript, DOS/Mac compatible, 2MB memory and 23 standard PostScript fonts.

TI microWriter Basic 5ppm, 14 HP LJ II fonts, Postscript upgradable option, 512K memory. TEX1Ø19 .... $519

TI microWriter PS65 5ppm, 14 HP LJ II fonts, Postscript, DOS/Mac compatible, 2MB memory and 65 standard PostScript fonts. TEX1Ø22 .... $929

TI microLaser Pro 600 PS23 .... $1,349
TI microLaser Pro 600 PS65 1,529

INTEL OVERDRIVE

intel

OverDrive 486SX20	$329
OverDrive 486SX25	439
OverDrive 486DX25	449
OverDrive 486DX33	579

MATH COPROCESSORS

intel

80287XL	$99
80387SL/SX	99
80387 (DX)	99

HARD DRIVES 40MB to 2.9 GIG!

HARD DRIVES International

Complete installation kit, including: 5 1/4" mounting frame, Data Cable Rail Set, Screws Jumper Blocks & Bezels HDI's Hard Drive Installation Guide with step-by-step installation instructions

Size	Access	Form Factor	Manufacturer	Interface	Model#	Bare Kit	16 Bit Kit
42MB	28ms	3.5" 1"H	Seagate	IDE	ST351A	$139	159
130MB	15ms	3.5" 1"H	Seagate	IDE	ST3144A	169	189
250MB	12ms	3.5" 1"H	Western Digital	IDE	WD225ØA	219	239
250MB	12ms	3.5" 1"H	Conner	IDE	CP3Ø254	229	249
340MB	12ms	3.5" 1"H	Western Digital	IDE	WD234ØA	279	299
345MB	15ms	3.5" 1"H	Maxtor	IDE/SCSI	MX7345A/S	299/349	349/489
452MB	12ms	3.5" 1"H	Seagate	IDE/SCSI	ST355ØA/N	409/539	429/689
520MB	12ms	3.5" HH	Fujitsu	IDE/SCSI	FJ2624A/S	569	619/749
540MB	12ms	3.5" 1"H	Seagate	IDE/SCSI	ST3655A/N	579/599	589/719
1050MB	15ms	3.5" FH	Seagate	SCSI	ST112ØØN	899	1,049
1050MB	10ms	3.5" HH	Micropolis	IDE/SCSI	MC2112A/S	839	859/989
1748MB	14ms	5.25" FH	Micropolis	SCSI	MC1548	1,029	1,179
1900MB	13ms	5.25" FH	Seagate	SCSI	ST421ØØN	1,479	1,629
2100MB	11ms	5.25" FH	Micropolis	SCSI	MC1926	1,949	2,099
2900MB	12ms	5.25" FH	Seagate	SCSI	ST434ØØN	2,099	2,2349

For 16 Bit (286/386/486) Kits Add: 1" to 1" interleave hard/floppy controller or appropriate interface. 8 Bit, 32 Bit & MAC Kits Available.

MONITORS

HITACHI

SuperScan™ 15s 15"
MPR II certified, 15" flat, square screen, 1024x768 non-interlaced, .28 dot pitch. CM1586 .... $499

SuperScan™ Elite 17"
MPR II certified, 17" flat, square screen, 1280x1024 non-interlaced, .26 -dot pitch. CM1797 .... $999

SuperScan™ 20s
1280x1024 non-interlaced. For publishing, CAD/CAM, windowing and large-screen applications. CM2Ø95MU $1,349

SuperScan™ Pro 20"
1280x1024 non-interlaced. .31 dot pitch. For publishing, CAD/CAM, Multimedia and windowing. CM2Ø87 .... $1,649

SuperScan™ Pro 21"
1600x1200 non-interlaced, .28 dot pitch. CM2187-515 .... $2,099

SuperScan™ Elite 21"
MPRII certified, flat, square screen, 1600 x 1200, non-interlaced, .2..8 dot pitch, RGB color control. CM2188 .... $2,499

If you don't see what you need -- call!

FREE Insight Catalog. Call now!

Insight

The Insight catalog is your Super Direct™ source for computers, hardware and software.

National Accounts - 800-998-8061
Corporate Fax - 602-902-1191
Government Fax - 602-902-1126
Educational Fax - 602-902-1177

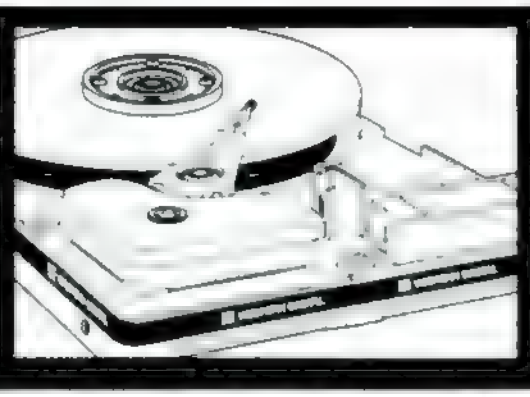
Prices and availability subject to changes without notice. PO's, Worry-Free Guarantee and 1-Year Systems Warranty may have some restrictions. Shipping is non-refundable. All trademarks are the properties of their respective owners. Opened software is not returnable. Intel Inside is a registered trademark of Intel Corporation. ©Insight Direct, Inc. 1/25/94

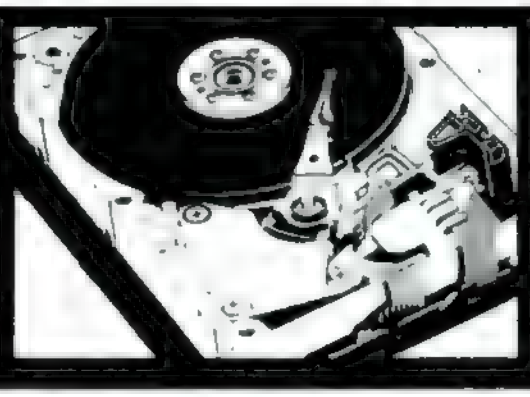
800-949-2307

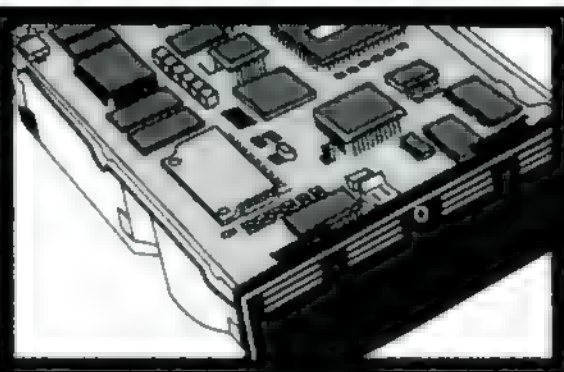
CIRCLE 219 ON READER SERVICE CARD

MEGAHAUS HARD DRIVES

Your Drive Company!







UNEQUALED REPUTATION

Nobody knows drives like MegaHaus. We have specialized in storage solutions for over 7 years. Repeat business from satisfied customers is the backbone of our business. We satisfy our customers.

DIRECT REPLACEMENT WARRANTY

During the first year of your warranty, we replace: not repair, any defective items. All items receive lifetime technical support from our factory trained techs.

SAME DAY SHIPPING

Our multi-million dollar inventory offers you the best diversity and availability in the market. We ship most orders the same day. Each order is checked at least four times for accuracy.

FAST, EASY INSTALLATION

Anyone can sell you a hard drive. We sell easy to install storage solutions. We spend countless hours researching the best solutions, then create our quick precise installation guides for each kit.

SPECIALS

SyQuest

105MB Removable Media Drive. The #1 storage solution for the 1990's. Hard drive speed (14.5ms). Low cost per MB. Mounts is 3 1/2" or 5 1/4" bay. Great for unlimited upgradability, data archival, transport & exchange, just to name a few.

SQ3105A IDE Drive Bare	$249	SQ3105S SCSI Drive Bare	$269
with GSI-18 & 1 disk	$329	with Adaptec 1522 & 1 disk	$399
Portable external, attaches		with Adaptec 1542 & 1 Disk	$529
to printer port with 1 cartridge	$399	External for MacIntosh & 1 Disk	$429

GSI GSI drive accelerators increase the data transfer rate of your IDE drive 30 to 80%. Works by enabling the drives Read Multiple & Write Multiple commands to greatly increase performance. We highly recommend these products for Conner, Quantum, Seagate, Micropolis, Maxtor, & Fujitsu.

	Alone	w/Drive
GSI-21 Board supports 2 IDE, 4 floppy drives. Doubles QIC-80 tape drive speed	$65	$55
GSI-18 Board supports 2 IDE drives. Works in conjunction with MFM, RLL, etc.	$55	$45
GSI-32 Board same as -21 adds 2 16550 serial ports & 1 bi-directional parallel port	$139	$119
GSI MaxIDEA Software solution works on existing IDE configuration (requires less than 1K of memory). Includes performance benchmark test.	$34	$25

HARD DRIVES

CONNER

IDE			
170MB	13ms	CFA170A	$189
250MB	14ms	CP30254H	$235
340MB	13ms	CFA340A	$299
540MB	10ms	CP30544	$569
SCSI			
540MB	10ms	CP30540	$579
1060MB	9ms	CFP1060S	$939

digital

SCSI			
1070MB	9.5ms	DSP3107	$949
1600MB	9.7ms	DSP3160	$1159
2103MB	9.7ms	DSP3210	$1559
3500MB	11ms	DSP5350	$2399
4000MB	11ms	DSP5400	$2599

FUJITSU

SCSI			
520MB	12ms	M2624F	$499
1080MB	9ms	M2694F	$829
2060MB	12ms	M2654S	$1449
IDE			
520MB	12ms	M2624T	$499

IBM

SCSI			
1052MB	8.6ms	662S12	$999

Maxtor

IDE			
245MB	15ms	7245A	$229
345MB	14ms	7345A	$288
540MB	14ms	7540A	$539
540MB	8.5ms	MXT540A	$689
SCSI			
245MB	15ms	7245S	$259
345MB	14ms	7345S	$329
540MB	8ms	MXT540S	$689

MICROPOLIS

IDE			
1050MB	10ms	MC2210A	$829
1740MB	10ms	MC2217A	$1089
SCSI			
1050MB	10ms	MC2210	$839
1750MB	10ms	MC2217	$1099
3020MB	11ms	MC1936	$1999

New! Audio / Visual tuned drives! Call $

WESTERN DIGITAL

IDE			
256MB	12ms	AC2250	$220
341MB	12ms	AC2340	$280
425MB	12ms	AC2420	$335
520MB	12ms	AC2540	$489

HARD DRIVES

Quantum

IDE			
170MB	14ms	LPS170A	$189
270MB	12ms	LPS270A	$259
342MB	12ms	LPS340A	$359
541MB	12ms	LPS540A	$555
SCSI			
170MB	14ms	LPS170S	$189
270MB	12ms	LPS270S	$259
342MB	12ms	LPS340S	$359
541MB	12ms	LPS540S	$585
1080MB	10ms	IMP1080	$879
1225MB	10ms	PD1225S	$969
1800MB	10ms	PD1800S	$1199

Seagate

IDE			
213MB	16ms	ST3243A	$199
260MB	16ms	ST3290A	$239
341MB	12ms	ST3390A	$319
452MB	12ms	ST3550A	$429
528MB	12ms	ST3655A	$559
SCSI			
2145MB	8ms	ST12550N	$1859

CONTROLLER CARDS

	Alone	w/Drive
ADAPTEC		
A1522KIT 16Bit SCSI	$99	$89
A1542CKIT 16Bit SCSI	$275	$259
A2742 EISA SCSI	$389	$369
A2842 VESA SCSI	$319	$299
T130 8Bit SCSI	$79	$65
T348 Parallel to SCSI	$189	$179
FUTURE DOMAIN		
850MCD 8Bit SCSI	$79	$65
1680SVP 16Bit SCSI	$155	$139

Many other types of controllers in stock.

HARD DISK CARDS

Drive & controller on card. Saves drive bay. Compatible with XT, AT, Tandy, and others.

170MB	$269	240MB	$339
340MB	$439	525MB	$779

IBM PS/1 PS/2 DRIVES

Complete solutions for your IBM. IBM recomends & buys from MegaHaus!

	170MB	240MB	340MB
PS/1 386 & 486	$239	$309	$389
PS/2 25, 30, 30-286	$299	$389	$479
PS/2 35 & 40	$229	$299	$379
PS/2 50 thru 95	$379	$459	$559

Larger capacities in stock. PS/1 286 120MB $589

MULTI-MEDIA KITS

Includes:
- Double speed CD ROM drive
- Media Vision Pro Audio 16
  - Pro Studio add $100
  - Pro Studio XL add $230
- Amplified Speakers
- Toolworks CD Bundle (World & US Atlas, Groliers Encyclopedia, San Diego Zoo's The Animals Chessmaster 3000, Mavis Beacon Teaches Typing)

Toshiba	XM3401	200ms	$589
Sony	CDU 561	295ms	$559
Sony	31A-03	325ms	$399
Teac	CD-50	265ms	$509

CD ROM DRIVES

NEC	3X!	195ms	$469
Toshiba	XM3401	200ms	$365
Sony	CDU561	295ms	$329
Teac	CD-50	265ms	$309

CD Caddies with drive only $4 each!

6 Disc Changer

Pioneer	DRM600	600ms	$839
Pioneer	DRM604X	300ms	$1199

CD SOFTWARE

CD Software not sold separately only with CD ROM Drives.

Bundle 1 San Diego Zoo's The Animals, Toolworks Reference Library, Toolworks/Groliers's Multimedia Encyclopedia, Toolworks World & US Atlas Pak, & Tempra Photo CD Access	$89
Bundle 2 San Diego Zoo's The Animals, Toolworks Reference Library, World Atlas, US Atlas w/ Auto Map, Sherlock Holmes, Sports Best, Arthur's Teacher Trouble, Chessmaster 3000, & Family Choice/ Britanica Encyclopedia	$159
Bundle 3 Toolworks Encyclopedia, Reference Library, World & US Atlas, Game Pack, Secret Weapons of the Luftwaffe	$79
Power Tools A great shareware library	$25
Family Doctor answers to 1500+ questions	$66
Game Pak II 10 games incl. Chessmaster 3000	$19
The Lord of the Rings A great new game	$45
Languages of the World 12 language translations	$32
Mayo Clinic medical ailments reference	$19
US Atlas w/ auto map intelligent road atlas	$29
CIA World Tour 248 CIA country profiles	$25

DRIVE ACCESSORIES

SCSI Drive enclosures	
3.5" vertical	$99
Half Height	$89
Full Height / Dual Half Height	$139
Dual Full Height / Four Half Height	$329
Four Full Height / Eight Half Height	$549
Removable drive brackets, turns any 3.5" hard drive into removable IDE / SCSI	$69/$119

TAPE DRIVES

CONNER

250MB QIC-80 tape drives includes software & tape

	Alone	w/drive
Internal fits 3.5 or 5.25 bay	$155	$139
External for printer port	$335	$325

SCSI Tape Drives

Kit is 16Bit card & 1 tape			Bare	Kit
580MB	Teac	MT01	$529	$729
.75-1.5Gig	Exabyte	2501	$699	$899
2Gig	Conner	4320	$799	$969
2Gig	HP	35470	$939	$1059
2-5Gig	Exabyte	8205	$1449	$1699
4-8Gig	Conner	4324	$1119	$1329
4-8Gig	HP	35480	$1079	$1299
4-16Gig	Sony	SDT5000	$1199	$1429
5-10Gig	Exabyte	8505	$2259	$2519

REMOVEABLE DRIVES

Syquest			Bare	Kit
44/88MB	20ms	SQ5110C	$259	$439

Syquest Media Best Price in this mag!

TEAC

	Alone	w/HD
Floppy 1.2 or 1.4 (no frame)	$52	$48
Floppy Combo 1.2 & 1.4	$124	$116

Removable Hard Disk Drive Kits

Very high quality removable drive 17ms IDE drive with docking bay

250MB $339 360MB $399

OPTICAL DRIVES

Kit is 16Bit Card & 1 disk		Bare	Kit
128MB	Fujitsu	$725	$879
1.3Gig	Hewlett Packard	$2659	$2959
1.3Gig	Maxoptix	$3199	$3479

Verbatim Optical Media	1	5
128MB / 650MB	$42/$109	$38/$95

Many other brands and types in stock.

NETWORKING PRODUCTS

ComTree

NE2000 Compatible Ethernet Products	
5 Year Warranty	Qty 1/5
16Bit ISA BNC or UTP	$69/$59
16Bit ISA Combo BNC & UTP	$75/$65
EISA Combo BNC & UTP	$269/$259
Micro Channel Combo	$199/$189
Netware Boot Rom for above	$20/$15
Portable Combo BNC & UTP	$149/$139
PCMCIA Type 2 BNC or UTP	$209/$190
Tranceiver BNC or UTP	$89/$79
10BaseT 8+1 port hub UTB	$289/$279

MEGAHAUS HARD DRIVES

1110 NASA Rd 1 #306

Houston, Texas 77058

1-800-786-1182

Ad. Code # PA12 Sales Hours (Central Standard Time)

8am - 7pm Monday thru Friday 9am - 3pm Saturday

FAX (713) 333-3024 Local (713) 333-1910

We sale within the United States, its territories, and Canada (sorry no international orders)

CIRCLE 018 ON READER SERVICE CARD

VISA MasterCard DISCOVER AMERICAN EXPRESS

NO SURCHARGE

We accept Fortune 500 & Government bids & PO's.

We check for COD and Credit Card fraud!

Prices & specifications subject to change without notice. Shipping charges are nonrefundable. Returns must be in new condition and in original packaging. Opened items may not be returnable. No refunds on software or special orders (items not listed in ad.) All refunds subject to 15% restocking fee. All trademarks are registered trademarks of their respective companies. Personal checks held for clearance. We reserve the right to refuse any sale for any reason. ©1993

IT WAS WRITTEN AGES AGO

MidWest Micro
WOULD UNCOVER
TODAY'S GREAT DISCOVERIES.

RULE YOUR EMPIRE WITH MIDWEST MICRO

Centuries ago, ancient Egyptian rulers spoke of a new empire that would form in the midwest, ruling over the computer industry. Using hieroglyphics, they inscribed this prophecy on a stone tablet, to be found and translated years later. Sure enough, in 1982, the MidWest Micro empire emerged. It brought precious discoveries and a new era of advancement to computer technology.

With 14 Computer Shopper Best Buy Awards and PC Computing's Five Star Rating for outstanding service and prices, MidWest Micro has already made history as the best source for computers and peripherals. We invite you to journey down the Nile with us and take home your own collection of treasures.

30-Day Guarantee Carved In Stone

Purchasing an Elite System or Notebook from MidWest Micro is risk-free and worry-free. Elite Systems and Notebooks are fully tested and burned in before shipment. Try an Elite System or Notebook for 30 days. If it doesn't meet your needs send it back and we'll refund your money. It's that simple.

Technical Support/Customer Service—At Your Beck And Call

Our System Consultants do more than answer questions; they listen to your needs, analyze the situation and then recommend a solution. You can depend on MidWest Micro's Technical Staff to help keep your Elite up and running through even the most difficult applications.

Guaranteed To Satisfy Even The Most Demanding Pharaoh

You need a computer you can depend on—that's why Elite Systems, Notebooks and SubNotes are backed by a one year warranty. During that time we offer immediate parts replacement for components you can easily install. For internal repairs, simply send us your system or notebook and we'll correct the problem within 72 hours. Our fast-turnaround times mean you'll never be without your Elite System for long.

24-Hour Shipping—The Fastest Journey Down The Nile

Why wait weeks to get the system you want? Order from MidWest Micro and get your Elite System or Notebook fast. Most standard configurations are shipped within 24 hours. If you'd prefer a custom configuration, we'll do our best to have it out our door within 72 hours.

Expand Your Empire With New Business Leasing Options

With NEW business leasing options from MidWest Micro your company can get the computer systems you need—today! Our affordable payment plans are designed to meet your business' monthly budget and free up capital for other important business ventures. One more way MidWest Micro helps you control your business expenses. Don't wait months to get the systems you need—call your MidWest Micro sales representative today for more details on leasing opportunities.

Build Your Own Monument With Custom Configuration

Get your system or notebook the way you want it. We can install fax modems, more RAM, a larger hard drive and all the other accessories you've been looking for. If you're configuring a system, you can even choose any one of our five new case designs. Ask your sales representative for details.

Built For A King

We've created majestic NEW cases for all our systems. Made for a king, these attractive cases have a sleek design that's both convenient and sturdy. They even offer more expansion options. Select from our slimline, desktop, mini-tower, mid-tower and full-tower cases. When you start with an Elite System, you start with a solid foundation—so adding peripherals is easy. Choose from our large selection of tape backups, modems, printers, memory upgrades, and more.

Colorado Memory Systems TBU #005988 $159

With high-speed data compression, this 250 Mb internal automatic tape backup unit copies up to 9.5 Mb per minute. It includes a FREE cable and easy-to-use Windows software.

It's No Secret

Did you know that when you buy a system from MidWest Micro you can add or exchange one of your floppy drives for a CD-ROM drive? It's easy. Ask your MidWest Micro representative for more details.

EPA Energy Star Logo

In an effort to be 100 percent energy efficient, MidWest Micro participates in the EPA's Energy Star Program. Only PC's monitors and printers that power down to less than 30 watts while idle are recognized in the program. MidWest Micro is dedicated to helping the environment and helping you save money on monthly electric bills. Call your MidWest Micro sales representative to learn more about the Energy Star Program.

MidWest Micro

* The Energy Star Emblem does not represent EPA endorsement of any product or service.

SIMPLE EXTERIORS CONCEAL THE INCREDIBLE POWER INSIDE

Slimline Value Systems

486SX-33 $999
#006621

Treasures:
- 80486SX-33 Processor
- 2 Mb High-Speed RAM
- 125 Mb IDE Hard Drive
- 1.44 Mb 3.5" Floppy Drive
- 14" SVGA .39 Color Monitor
- 16-Bit SVGA Card with 512K
- 1 Parallel and 2 Serial Ports
- 101-Key Enhanced Keyboard
- Slimline Case
- FREE Microsoft DOS 6.2 Installed

486DX-33 $1139
#006622

VESA Value Systems

486DX-33 $1449
#006600

Treasures:
- VESA Local Bus Motherboard
- Intel 80486DX-33 Processor
- 128K High-Speed Cache
- 4 Mb High-Speed RAM
- 32-Bit VESA Local Bus IDE Card
- 245 Mb IDE Hard Drive
- 1.44 Mb 3.5" Floppy Drive
- 1.2 Mb 5.25" Floppy Drive
- 14" SVGA .28 Non-Interlaced Color Monitor
- 32-Bit VESA Local Bus SVGA Video Card
- 1 Parallel, 2 Serial & 1 Game Port
- 101-Key Enhanced Keyboard
- High-Resolution, 3-Button Mouse
- Mini-Tower Case
- FREE Microsoft DOS 6.2 Installed
- FREE Microsoft Windows Installed

486DX2-50 $1499
#006601

486DX2-66 $1669
#006602

VESA Windows Systems

486DX-33 $1579
#006607

Treasures:
- VESA Local Bus Motherboard
- Intel 80486DX-33 Processor
- 128K High-Speed Cache
- 4 Mb High-Speed RAM
- 32-Bit VESA Local Bus IDE Card
- 245 Mb IDE Hard Drive
- 1.44 Mb 3.5" Floppy Drive
- 1.2 Mb 5.25" Floppy Drive
- 15" SVGA .28 Non-Interlaced Multi-Scan Color Monitor
- Diamond Stealth 24 VESA Local Bus SVGA Video Card
- 1 Parallel, 2 Serial & 1 Game Port
- 101-Key Enhanced Keyboard
- High-Resolution, 3-Button Mouse
- Mid-Tower Case
- FREE Microsoft DOS 6.2 Installed
- FREE Microsoft Windows Installed

486DX2-50 $1629
#006608

486DX2-66 $1799
#006609

VESA Multimedia Systems

486DX-33 $1899
#006610

Treasures:
- VESA Local Bus Motherboard
- Intel 80486DX-33 Processor
- 128K High-Speed Cache
- 4 Mb High-Speed RAM
- 245 Mb IDE Hard Drive
- 32-Bit VESA Local Bus IDE Card
- 1.44 Mb 3.5" Floppy Drive
- Dual Speed Multi-Session Multimedia CD-ROM Drive
- 3 Disk CD-ROM Software Library
- 16-Bit High-Performance Sound Card
- Digital-Quality, Compact Speakers
- 15" SVGA .28 Non-Interlaced Multi-Scan Color Monitor
- 32-Bit VESA Local Bus SVGA Video Card
- 1 Parallel, 2 Serial & 1 Game Port
- 101-Key Enhanced Keyboard
- High-Resolution, 3-Button Mouse
- Mini-Tower Case
- FREE Microsoft DOS 6.2 Installed
- FREE Microsoft Windows Installed

486DX2-50 $1949
#006611

486DX2-66 $2099
#006612

VESA CAD Systems

486DX-33 $2199
#006613

Treasures:
- VESA Local Bus Motherboard
- Intel 80486DX-33 Processor
- 256K High-Speed Cache
- 8 Mb High-Speed RAM
- 32-Bit VESA Local Bus IDE Card
- 340 Mb IDE Hard Drive
- 1.44 Mb 3.5" Floppy Drive
- 1.2 Mb 5.25" Floppy Drive
- 17" SVGA .26 Non-Interlaced Multi-Scan Color Monitor
- Diamond Stealth 24 VESA Local Bus SVGA Video Card
- 1 Parallel, 2 Serial & 1 Game Port
- 101-Key Enhanced Keyboard
- High-Resolution, 3-Button Mouse
- Full-Tower Case
- FREE Microsoft DOS 6.2 Installed
- FREE Microsoft Windows Installed

486DX2-50 $2279
#006614

486DX2-66 $2429
#006615

PCI Local Bus System

486DX2-66 $2999
#006618

Elite's PCI Systems have a 32-bit data path and 33 MHz clock speed to produce maximum data transfer rates of 132 megabytes per second—a monumental improvement over standard ISA buses' 5 Mb/sec transfer rate! And since they are self-configuring, you should never have to touch switches or jumpers in Elite PCI Systems.

Treasures:
- PCI Local Bus Motherboard
- Intel 80486DX2-66 Processor
- 256K High-Speed Cache
- 8 Mb High-Speed RAM
- 32-Bit PCI Local Bus SCSI Interface
- 340 Mb SCSI Hard Drive
- 1.44 Mb 3.5" Floppy Drive
- 15" SVGA .28 Non-Interlaced Digital Color Monitor
- PCI Local Bus Accelerated SVGA Video Card
- Dual Speed Multimedia CD-ROM Drive
- 3 Disk CD-ROM Software Library
- 16-Bit High-Performance Sound Card
- Digital-Quality, Compact Speakers
- Internal 14.4 Modem
- 1 Parallel & 2 Serial Ports
- 101-Key Enhanced Keyboard
- High-Resolution, 3-Button Mouse
- Full-Tower Case
- FREE Microsoft DOS 6.2 Installed
- FREE Microsoft Windows Installed

486DX-33 $2769
#006616

486DX2-50 $2849
#006617

MidWest Micro

6910 U.S. Route 36 East, Fletcher, Ohio 45326
1-800-682-7256
Fax: 1-800-562-6622
Monday-Friday: 9 a.m. to 7 p.m. Saturday: 10 a.m. to 4 p.m.

For your protection we check thoroughly for stolen credit cards.

Dealers Call
1-800-682-0522
Outside U.S. Call:
1-513-368-2309
Customer Service & Technical Support Call
1-800-243-0313

For your protection we check thoroughly for stolen credit cards. Prices and availability are subject to change. We are not responsible for errors in typography and photography. See policy statement for further details.

AD#G0101

MidWest Micro

Elite 486SX/DX Notebook

SL-Enhanced Processor
Up to 340 Mb HD
PCMCIA Type III

A Dream Come True

Almost every ancient Egyptian dreamed of having a portable computer. Thanks to the 486SX/DX Notebooks, their dreams can come true for you.

These Elite Notebooks feature Intel's "SL-Enhanced" microprocessors, delivering excellent power management and a long battery life. The centerpiece of SL Technology is the System Management Mode (SMM), which allows your Notebook to slow down, suspend or completely shut down various components of your system.

The 486SX/DX Notebooks come with a divine gift—the gift of choice. Depending on your specific needs, choose from an 80, 120, 200 or 340 Mb hard drive, an upgradeable 486SX-25, 486DX-33, 486DX2-50 or 486DX2-66 processor and a large 10" monochrome, dual-scan color or active-matrix color screen.

Elite's 486SX/DX Notebooks also feature the latest PCMCIA technology. They all have a PCMCIA Type III slot, which accepts two Type I cards, two Type II cards or one Type III card. Use these cards to add memory enhancements, network adapters, modems and more.

Buy the notebook ancient Egyptians only dreamed of—order your Elite 486SX/DX Notebook today.

120 Mb	486SX-25	486DX-33	486DX2-50	486DX2-66
Monochrome	#005501 $1529	#005516 $1769	#005531 $1799	#005546 $1959
Dual-Scan Color	#005506 $1999	#005521 $2399	#005536 $2449	#005551 $2599
Active-Matrix Color	#005511 $2999	#005526 $3299	#005541 $3329	#005556 $3499

For an 80 Mb hard drive subtract $40, For a 200 Mb hard drive add $100, For a 340 Mb hard drive add $280

Treasures:

Processor:
Intel 486SX-25, 486DX-33, 486DX2-50 or 486DX2-66
SL-Enhanced upgradeable processor

RAM:
4 Mb, expands to 20 Mb

Hard Drive:
80 Mb, 120 Mb, 200 Mb or 340 Mb

Screen:
10", 640 x 480 VGA resolution
Backlit display
Color - 256 colors
Monochrome - 64 gray shades

Battery Life*:
Active Color - 3 hours
Dual-Scan Color - 4 hours
Monochrome - 6 hours

Weight:
Color - 6.9 lbs.
Monochrome - 6.4 lbs.

512K DRAM plus 64K VRAM for turbo bus accelerated video technology

Simultaneous video on active-matrix color and monochrome units

86 keys with 101-key emulation

Built-in trackball

Built-in 1.44 Mb, 3.5" floppy drive

Advanced Power Management

One parallel and one serial port

External VGA and keyboard connectors

One PCMCIA Type III slot/ two Type II slots

FREE AC adapter and utilities disk

FREE MS-DOS 6.2 installed

FREE carrying case

Elite 486SX-25 SubNote

Ancient Egypt is known for great myths, historical treasures and powerful dynasties. You can discover another source of great power with Elite's 486SX-25 SubNote.

The 486SX-25 has the latest features, like Intel's "SL-Enhanced" processor, Advanced Power Management and PCMCIA technology.

It's a mystery how a little 3.9 lb. SubNote contains as much power as a desktop, but it does. The 486SX-25 comes with 4 Mb of RAM, expandable to 12 Mb, a fast 25 MHz processing speed and your choice of an 80, 120, 200 or 340 Mb hard drive. It also delivers excellent 640 x 480 VGA resolution on its 10" high-contrast screen producing clear, concise images that even a mummy can easily see!

Elite's unforgettable SubNote symbolizes power, ground-breaking technology and true portability. Before you hop on your camel to start your next historical journey—call MidWest Micro and order the 486SX-25.

Treasures:

Processor:
Intel 486SX SL-Enhanced upgradeable processor
Processing Speed:
25 MHz
RAM:
4 Mb expands, to 12 Mb
Hard Drive:
80 Mb, 120 Mb, 200 Mb or 340 Mb

Screen:
10", 640 x 480 VGA resolution
Backlit display
64 gray shades
Battery Life*:
5 hours
Weight:
3.9 lbs.
512K DRAM plus 64K VRAM for turbo bus accelerated video technology
Simultaneous video

83 keys with 101-key emulation
Built-in trackball
External 1.44 Mb, 3.5" floppy drive
Advanced Power Management
Nickel metal hydride battery
One parallel and one serial port
External VGA and keyboard connectors
One PCMCIA Type II slot
FREE AC adapter and utilities disk
FREE MS-DOS 6.2 installed
FREE carrying case

486SX-25 SubNote		
80 Mb	#005575	$1439
120 Mb	#005576	$1479
200 Mb	#005577	$1579
340 Mb	#005578	$1759

Elite 486SLC-33 Color/Monochrome Notebook

Discover the riches of the land with your Elite 486SLC-33 Notebook. This portable is perfect for long journeys due to its compact size and energy-saving SUSPEND/RESUME feature. You can even compute up to six hours on a single charge!

Available in color or monochrome, the Elite comes with a fast 33 MHz processor, internal cache memory and up to 8 Mb of RAM—giving you more power for your money!

Both 486SLC-33 models have a record of unparalleled success in eliminating distortion and eyestrain with their non-glare VGA screens. Images appear at up to 640 x 480 resolutions in 64 gray shades or 256 colors revealing eye-catching text, graphics and hieroglyphics.

Your Elite's LCD panel lets you know which drives are being accessed, when battery power is low, what function keys are enabled, whether external power is being used and if there is a modem ring. All the information you desire is right before your eyes!

The wait is over for both you and the Pharaohs. Your Elite Notebook is here—and it's just a toll-free phone call away.

Treasures:

Processor:
Cyrix 486SLC-33
Processing Speed:
33 MHz
RAM:
2 Mb RAM, expands to 8 Mb
Hard Drive:
80 Mb, 120 Mb or 200 Mb
Floppy Drive:
Built-in 1.44 Mb 3.5"
Screen:
Color - 9", 256 colors
Monochrome - 10", 64 gray shades

Video RAM:
Color - 512K
Monochrome - 256K
Keyboard:
83 key with 101-key emulation
2-button thumball mouse
Weight:
Color - 5.7 lbs. with battery
Monochrome - 5.4 lbs. with battery
Battery Life*:
Color - 4 hours
Monochrome - 6 hours

640 x 480 resolution
Simultaneous video
Advanced Power Management
One parallel and one serial interface
External VGA monitor and keyboard connectors
FREE AC adapter, carrying case and MS-DOS 6.2 installed
One year manufacturer's warranty

	80 Mb	120 Mb	200 Mb
Color	#005461 $1599	#005466 $1659	#005471 $1759
Monochrome	#005446 $1199	#005451 $1239	#005456 $1339

*Battery life measured with Power Management enabled. Actual battery life may vary.

MidWest Micro

6910 U.S. Route 36 East, Fletcher, Ohio 45326
1-800-682-7256
Fax: 1-800-562-6622
Monday-Friday: 9 a.m. to 7 p.m. Saturday: 10 a.m. to 4 p.m.

For your protection we check thoroughly for stolen credit cards.

Dealers Call:
1-800-682-0522
Outside U.S. Call:
1-513-368-2309
Customer Service & Technical Support Call:
1-800-243-0313

For your protection we check thoroughly for stolen credit cards. Prices and availability are subject to change. We are not responsible for errors in typography and photography. See policy statement for further details.

AD#G0103

CIRCLE 398 ON READER SERVICE CARD

A New Generation of Choices

Only from

VTECH™

Are you looking for the Ultimate in Upgradability and Performance? Are you looking for More Features and Better Value ?

VTech delivers both. With VTech you get twice the choices - our expotech series has established a position as the highest value line of systems in the industry and the new Platinum series has already been acknowledged as a leader in advanced computer designs where performance is the bottom line.

VTech is a manufacturer of complete systems, not just an assembler. With VTech you get the high performance you need for today's software and the quality and support you can only get from an international manufacturer with over 10,000 employees and 3 research and engineering labs.

intel inside

Choose Hot Value

Only a manufacturing company can afford to offer the lowest prices. Up to 25% lower

When you're a manufacturer that designs and makes its own components, you cut out the middle man. That means lower costs for us, *and better value for you.* ***Check it out!***

Only a quality driven company can stand behind it's product with a 3 Year Warranty

Why can Expotech offer a longer warranty then others? Because our research engineers are continually improving existing product design and manufacturing technology to assure highest quality, full compatability and superior performance, we can offer a longer warranty than the leading competition.

Only an innovative company can offer a FREE software preview.

We've teamed up with Microsoft to offer pre-installed versions of the most popular software titles. Now you can buy only after you know about the software and know what's right for you.

- Every system comes pre-installed with the best titles from Microsoft
- Demos explanations are given to you on line.
- Simply call the toll free number provided and buy the program (at deep discounted prices) with a credit card
- Instantly, you'll be given an unlocking key code to release the full program

expotech™ by VTECH™

Only a technologically advanced company can build in Remote diagnostics and a Send/Receive Modem/Fax with every system

Every Expotech computer is equipped with a modem and special software that will let us access your computer, diagnose the hardware, solve the problem. *All from the comfort of your own telephone!*

3 YEAR WARRANTY

Standard Features

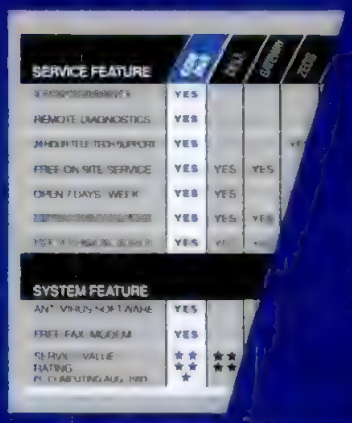
- Intel Pentium Technology ready
- Local Bus Graphics Accelerator with 1 MB RAM
- Desktop Metal Cases
- 5.25" and 3.5" floppy drives
- Remote Diagnostics Software
- 9600/2400 send/receive Fax/modem
- Anti-Virus Software
- Multi I/O - 2 Serial and 1 Parallel
- High performance-Tactile Keyboard
- MS-DOS 6.2, Windows 3.1

BEST BUY ▼

System 1	System 2	System 3	System 4	System 5
All Standard Features+	All Standard Features+	All Standard Features+	All Standard Features+	All Standard Features+
Intel 486SX25	Intel 486SX33	Intel 486DX33	Intel 486DX2/50	Intel 486DX2/66
210MB hard drive	210MB hard drive	340MB hard drive	424MB hard drive	424MB hard drive
4MB RAM	4MB RAM	4MB RAM	4MB RAM	8MB RAM
14" .28 non-interlaced monitor	14" .28 non-interlaced monitor	14" .28 non-interlaced monitor	14" .28 non-interlaced monitor	15" .28 non-interlaced monitor
		With 128k cache	With 128k cache	With 128k cache
$1149	**$1199**	**$1499**	**$1599**	**$1999**

Popular Options

■ 4, 8, or 16MB RAM ■ 15" .28 non-interlaced monitor ■ 17" .28 non-interlaced monitor ■ Combo floppy drives



SERVICE FEATURE				
[illegible]	YES			
REMOTE DIAGNOSTICS	YES			
24 HOUR TELE-TECH SUPPORT	YES			
FREE ON SITE SERVICE	YES	YES	YES	
OPEN 7 DAYS WEEK	YES	YES		
[illegible]	YES	YES	YES	
[illegible]	YES			

SYSTEM FEATURE				
ANTI VIRUS SOFTWARE	YES			
FREE FAX MODEM	YES			
SERVICE VALUE RATING	★★★★★	★★★★		

intel inside

Novell Labs Tested & Approved

MICROSOFT WINDOWS COMPATIBLE

VTECH™ Technology you can afford

Call 1.800.284.3976 *in Canada 1.800.685.8284*

Software, Modem & Service Package for Desktop & Tower Systems Only
All Prices, Availability and Specifications subject to change without notice
Please call to confirm pricing, S. Sales Tax, Availability, and Warranty Details.
The Intel Inside logo is a trademark of Intel Corporation

expotech™ BY VTECH™

Choose VESA Performance

3 YEAR WARRANTY

Standard Features

- Intel Pentium Technology ready
- 2 VESA expansion slots
- VLB Graphics Accelerator with 1 MB RAM
- Desktop Metal Cases
- 3.5" floppy drive
- Remote Diagnostics Software
- 9600/2400 send/receive Fax/modem
- Anti-Virus Software
- Multi I/O - 2 Serial and 1 Parallel
- High performance-Tactile Keyboard
- MS-DOS 6.2, Windows 3.1

Vesa Local Bus Systems

If you're after high speed Windows performance, the VESA local bus systems from Expotech deliver. By using the latest in VESA local bus technology these systems blow away the competition at prices that prove Expotech is the value leader.

By using the tremendous manufacturing resources of VTech, Expotech can deliver high quality products at the lowest possible cost. Expotech is the only choice when the bottom line is getting the most for your money.

Two VESA local bus slots are provided as our high speed graphics accelerator make the VESA system from Expotech the highest value VLB system available.

BEST BUY ▼

System 1	System 2	System 3	System 4	System 5
All Standard Features+	All Standard Features+	All Standard Features+	All Standard Features+	All Standard Features+
Intel 486SX33	Intel 486DX33	Intel 486DX2/50	Intel 486DX2/66	Intel 486DX2/66
250MB hard drive	340MB hard drive	424MB hard drive	424MB hard drive	527MB hard drive
4MB RAM	4MB RAM	4MB RAM	8MB RAM	16MB RAM
14" .28 non-interlaced monitor	14" .28 non-interlaced monitor	14" .28 non-interlaced monitor	14" .28 non-interlaced monitor	15" .28 non-interlaced monitor
	With 128k cache	With 128k cache	With 128k cache	With 128k cache
$1299	$1549	$1699	$1999	$2499

Popular Options

- 4, 8, or 16MB RAM
- 15" .28 non-interlaced monitor
- 17" .28 non-interlaced monitor
- Combo floppy drives

TOWER OPTIONAL

- **24 hour tele-tech support.** Toll free tele-technical support available 24 hours a day.
- **30 day money back guarantee.** Full refund if you're not satisfied in the first 30 days after shipment.

VTECH™ Technology you can afford

Call 1.800.284.3976 *in Canada 1.800.685.8284*

intel inside

Choose Interactive Multi-Media

expotech™ BY VTECH™

Standard Features

- Intel Pentium Technology ready
- Accelerated Local Bus
- Desktop Metal Cases
- Remote Diagnostics
- 9600/2400 send/receive Fax/modem
- 3.5" floppy drive
- Double speed CD ROM
- Stereo speakers
- Stereo sound board
- High performance keyboard
- MS-DOS 6.2, Windows 3.1
- AD-lib, MPC compatible
- Sound blaster compatible
- Compton's Interactive Encyclopedia
- Webster's Dictionary
- World Atlas

BEST BUY ▼

System 1	System 2	System 3	System 4	System 5
All Standard Features+	All Standard Features+	All Standard Features+	All Standard Features+	All Standard Features+
Intel 486SX25	Intel 486SX33	Intel 486DX33	Intel 486DX2/50	Intel 486DX2/66
250MB hard drive	250MB hard drive	VLB accelerated graphics	VLB accelerated graphics	VLB accelerated graphics
4MB RAM	4MB RAM	340MB hard drive	424MB hard drive	424MB hard drive
14" .28 non-interlaced monitor	14" .28 non-interlaced monitor	4MB RAM	4MB RAM	8MB RAM
		14" .28 non-interlaced monitor	15" .28 non-interlaced monitor	15" . 28 non-interlaced monitor
		With 128k cache	With 128k cache	With 128k cache
$1499	$1549	$1799	$1999	$2299

Popular Options ■ 4, 8, or 16MB RAM ■ 15" .28 non-interlaced monitor ■ 17" .28 non-interlaced monitor ■ Combo floppy drives

- **Bulletin board service.** Download drivers and talk to techs on line
- **Visa, Mastercard, Discover**
- **Corporate leasing available**
- **Purchase orders accepted.** COD and terms for qualified buyers

intel inside

Tested & Approved

MICROSOFT WINDOWS COMPATIBLE

Software, Modem & Service Package for Desktop & Tower Systems Only. All Prices, Availability, and Specifications subject to change without notice. Please call to confirm pricing, S. Sales Tax, Availability, and Warranty Details. The Intel inside logo is a trademark of Intel Corporation.

Multi-Media Systems

Multi-Media systems can really turn your computer into a complete information resource for you and your family. Stereo sound and full motion video, interactive encyclopedia, educational software and games really come to life.

VTech has been building complete m media systems for years and we kn what it takes to get all system comp working together. Your VTech sys arrive completely setup and read

The VTech multi-media systems double speed CD-ROM drives t les the data throughout and re enhances video and audio pe of today's multi-media softwa

The VTech sound board pr voices rather than the usu voices the other manufact

VTECH

Technology you e

VTECH™ Platinum™

The VTech Platinum 486 SMP systems are the fulfillment of a long standing desire to build a desktop computer that alters the commonly accepted perceptions of a standard desktop computer.

3 YEAR WARRANTY

Platinum Upgrade Options

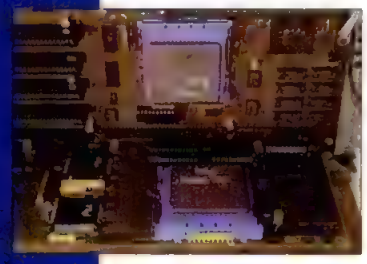
- Dual Pentium Overdrive™
- Single Pentium Overdrive™
- Dual 486DX2/66
- Single 486DX2/66

VTECH™ Technology you can afford

The most advanced 486 system available

Advanced technology makes the difference.

The VTech Platinum 486 computers are the fastest, most powerful systems available. Imagine a system so fast it can keep up with Dual Symmetrical Multiprocessing Pentium™ Overdrive processors and you'll understand why the VTech Platinum single processor 486 system outperforms all other systems on the market.



Each VTech Platinum 486 is designed with an exclusive copy back cache with cast-out buffering, high performance memory design, VESA Local Bus slots, two cooling fans, on board SCSI II, and self-sensing setup all managed by the industry's most advanced BIOS.

These are just a few of the advanced technology features that make the VTech Platinum computers the highest performing systems available.

The benefits are high performance, ease of use and more upgradability - your system will perform better, work harder and last longer.

The VTech difference

Because we control the complete design and manufacturing process, we can control the quality of our systems. VTech has been an OEM provider to some of the largest names in the business, companies that demand quality and depend on VTech.

We stand behind this commitment of quality with a 3 year warranty and the best customer support in the business. VTech is a name you can depend on.

Upgradability

As your needs change and new software pushes the limits of today's hardware, the VTech Platinum systems can be expanded to meet the challenge.

VTech provides you with three upgrade paths. From the single processor Platinum 486 you can upgrade to dual 486 processors, a single Pentium Overdrive™ processor, or for the ultimate in power and performance, dual Pentium Overdrive™ processors.

The VTech Platinum 486 is the only desktop computer that is Pentium OverDrive Ready and Symmetrical Multiprocessor ready. No more worrying about obsolescence - the VTech Platinum gives you the high performance you need today and the upgradability you'll need tomorrow.

Whether you start with the VTech Platinum 486 Single Processor or choose an SMP Dual Processor System, you're getting the most advanced computer system available.

The bottom line

The VTech Platinum 486 SMP delivers the performance you need for today's software and is unique in its ability to expand to meet the demands of tomorrow's high performance software and operating systems.

Compare these features anywhere and you'll see why the VTech Platinum has already received top recognition from industry experts.

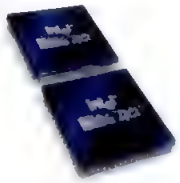
The bottom line - *the VTech Platinum is the best value in high performance computers.*

"VTech delivers a fast multiprocessor system at a single processor price." *Computer Shopper,*

VTech Platinum is SMP ready

The experts agree, your next system should be multiprocessor ready, As *PC Week* said on August 23, 1993 ,"Multiprocessing is clearly the wave of the future".

The VTech Platinum system features a unique, patented design that brings true Symmetrical Processing capabilities to the desktop. As *PC Magazine* said on October 12, 1993, "VTech leads in PC Multiprocessing".



With Microsoft Windows NT™ the VTech Platinum SMP is an efficient way to double your power. Like a two lane highway that suddenly becomes four lanes, processing flows with greater ease and efficiency.

SMP READY

Whether you start with the VTech Platinum 486 Single Processor or choose an SMP Dual Processo System, you're getting the most advanced computer system available.

intel inside

Microsoft Windows NT

...Only from VTech

486DX2/50 single

- Intel 486DX2/50 Processor
- Pentium Overdrive™ ready
- SCSI II (on board)
- 256k Cache
- VESA Local Bus
- S3 Windows Accelerator Video Card w/1MB RAM
- 8MB System RAM
- 3.5" Floppy Drive
- 424MB Hard Drive
- 16550 Serial Port Controllers
- 15".28 Non-Interlaced Monitor
- MS DOS 6, Windows 3.1
- High Resolution Mouse

$2199

486DX2/66 single

- Intel 486DX2/66 Processor
- Pentium Overdrive™ ready
- SCSI II (on board)
- 256k Cache
- VESA Local Bus
- S3 Windows Accelerator Video Card w/1MB RAM
- 12MB System RAM
- 3.5" Floppy Drive
- 424MB Hard Drive
- 16550 Serial Port Controllers
- 15".28 Non-Interlaced Monitor
- MS DOS 6, Windows 3.1
- High Resolution Mouse

$2499

486DX2/66 plus

- Intel 486DX2/66 Processor
- Pentium Overdrive™ ready
- SCSI II (on board)
- 256k Cache
- VESA Local Bus
- S3 Windows Accelerator Video Card w/1MB RAM
- 16MB System RAM
- Double Speed CD-ROM
- 3.5" Floppy Drive
- 424MB Hard Drive
- 16550 Serial Port Controllers
- 15".28 Non-Interlaced Monitor
- MS DOS 6, Windows 3.1
- High Resolution Mouse

$2999

486DX2/66 dual

- 2 Intel 486DX2/66 Processors
- Pentium Overdrive™ ready
- SCSI II (on board)
- 256k Cache
- VESA Local Bus
- S3 Windows Accelerator Video Card w/1MB RAM
- 16MB System RAM
- Double Speed CD-ROM
- 3.5" Floppy Drive
- 527MB Hard Drive
- 16550 Serial Port Controllers
- 15".28 Non-Interlaced Monitor
- MS DOS 6, Windows 3.1
- High Resolution Mouse

$3999

Options

- 17".28 Monitor
- CD ROM Upgrades
- Increased RAM
- High Speed 14.4 Modems
- Combo Floppy Drives
- Multi-Media kit

Twice the Power, Performance & Expandability

Specifications

Processor
- Intel 486DX2/50 or 486DX2/66
- ZIF processor socket - Pentium Overdrive™ ready

Optional Multiprocessor
- MP Power Card with a second Intel 486DX2/50 or 486DX2/66 processor

Secondary Cache
- 256k Cache (Copy back w/cast out buffering)

Memory
- Supports 4, 8, 16 or 32MB SIMMS Four 72 pin SIMM sockets support 36 bit JDEC style SIMMs which may be inserted in any configuration

Bus Slots
- Six (6) ISA Slots
- Two (2) VESA VL Slots
- One (1) MP Connector Slot

Ports
- Two (2) serial ports 16550-DB9
- One (1) serial port ECP-DB25
- PS/2 mouse port
- IDE port-floppy controller
- SCSI II connector on board

Chassis
- Height 6.5" Width 16.6" Depth 17.1"
- Supports three 5.25" or 3.5" external drive bays and one 3.5" Internal hard disk drive

The Expandable 486

Advanced BIOS
- Supports multiprocessing start-up for advanced SMP capable operating system (Windows NT)
- Automatically detects and reports all processors installed and active
- Flexible memory configuration supports 288MB floppy drives
- Ability to autotype IDE hard disk
- Built-in Adaptec SCSI II support
- Two level password protection

Introducing Pentium. The newest addition to the Platinum series

Standard Features

- Intel 60MHz Pentium processor
- Next generation Pentium Overdrive processor P5T ready
- 256k cache
- 2 PCI expansion slots
- Window's accelerator with 1MB expandable to 2MB
- Dual cooling fans
- Advance BIOS with 2.88MB floppy drive support
- Energy saving functions utilizing Intel System Management mode
- Two fast serial ports (16550 support)
- Enhanced paralell port
- Enhanced capabilities port
- Supports VTech Mezzanice board (business audio, networking and modem)
- 3.5" floppy drive
- PCI SCSI II processor on board (optional)
- Self sensing set-up
- High performance-tactile keyboard
- MS-DOS 6.2, Windows 3.1

BEST BUY

Platinum P5-60

- All Standard Features+
- 424MB hard drive
- 8MB RAM
- Double speed CD-ROM

$2995

Platinum P5-60

- All Standard Features+
- 527MB hard drive
- 16MB RAM
- Double speed CD-ROM
- 17" non-interlaced monitor

$3995

Popular Options

- 4MB, 8MB, 16MB or 32MB RAM
- 17" non-interlaced monitor
- Combo floppy drives

For more information and to order call

1.800.284 3976 FAX:1.800.947 3976

GOVERNMENT & EDUCATION 1.800.947.6461 CANADA 1.800.685.8284

7 days a week: CENTRAL STANDARD TIME
MONDAY-FRIDAY 7AM - 8:30PM / SATURDAY 9AM - 6PM SUNDAY 10AM - 3PM
AN EXPERIENCED KNOWLEDGEABLE REPRESENTATIVE
CAN HELP YOU WITH ANY QUESTIONS

3 YEAR WARRANTY

VTECH™ 800 Church Street
Lake Zurich Illinois 60047

Software, Modem & Service Package for Desktop & Tower Systems Only
All Prices, Availability, and Specifications subject to change without notice.
Please call to confirm pricing, It. Sales Tax, Availability, and Warranty Details.
The Intel Inside logo is a trademark of Intel Corporation

CIRCLE 305 ON READER SERVICE CARD

VTECH™ Platinum™

- Toll Free 24 Hour Tele-Tech Support
- Bulletin Board Service
- Three Year Warranty
- One Year On-Site Warranty
- 30-Day Money Back Guarantee

No one else can offer you so much value, dependability and support... Only

VTECH™

Cutting edge technology you can a

expotech VTECH

VTE Pl

MEMORY · MEMORY

FOR CURRENT SAUL IRON PRICING

SIMM MODULES

1 x 9 (3-chip)	$43
4 x 9	$155
1 x 36	$181
2 x 36	$354

Apple Type

1MB x 8-70	$47
4MB x 8 -70	$145
1 x 32-70ns	$149
2 x 32 70ns	$287

IBM Type

1 x 9-70ns (9 chip)	$46
1 x 9-80ns Static Col.	$52
512K x 36 (2MB)	$76
4MB x 36 (16MB)	$640

LASER PRINTER MEMORY

Brother HL-4

2MB	MB-420	$147	4MB MB-440 $225

Brother HL-6e, HL-6d, HL-6

1MB	MB-810	$80	2MB MB-820 $120

Brother HL-10V/10V

2MB	MB-1020	$119	4MB MB-1040 $219

Canon LBP-4SX

1MB	003-0010-000	$108	2MB 003-0020-000 $189

Canon LBP-4, 4Lite, 4Plus

1MB	563-2230	$106	2MB N/A $145

Canon LBP-8II, 8IIF, 8III

2MB	563-1880	$111	4MB N/A $189

Canon LBP-4V, 8III Plus

2MB	563-2350	$145

Compaq PAGEMARQ 15, 20

4MB	126360-001	$194	8MB 126361-001 $376

Epson EPL 6000

2MB	X85401	$120	4MB N/A $198

Epson ActionLaser II, EPL-8000

2MB	N/A	$135	4MB N/A $213

Epson EPL-7500

2MB	C82205J	$124	4MB C82202J $235

HP LaserJet 4L

1MB	C2024A	$47

HP LaserJet IIP, III, IIIP, IIID

2MB	334758	$97	4MB 334778 $170

HP LaserJet II, IID

2MB	334448	$110	4MB 334458 $195

HP LaserJet IISi, 4, 4M, 4Si, 4SiMX, 2LX300, DeskJet 1200c

1MB	C2063A	$39	2MB C2064A $76
4MB	C2065A	$181	8MB C2066A $354

HP DeskJet 500, 500C

256K	227078	$40

HP DesignJet 600 Inkjet Plotter

4MB	C2065A	$181	8MB C2066A $354

IBM/Lexmark Laser 4029 All Models

2MB	1183334	$96	4MB 1183335 $157

IBM/Lexmark Laser 4019, 4019w

2MB	1039137	$115	3.5MB 1038675 $173

IBM/Lexmark Laser 4039, 4079 All Models

4MB	1328363	$167	8MB 1328365 $326

Kyocera FS-1500A Ecosys

2MB	N/A	$141	4MB N/A $182

Kyocera FS-3500A Ecosys dSi

1MB	N/A	$45	4MB N/A $167

NEC SilentWriter 95 & 97 series

2MB	N/A	$100

OkiLaser 400

1MB	70014701	$67	2MB N/A $106

OkiLaser 800, 820

2MB	N/A	$157	4MB N/A $190

OkiLaser 830

1MB	70021001	$93	2MB 70021101 $132

OkiLaser 820, 840

2MB	70016501	$126

Panasonic LaserPartner 4410, 4430

2MB	KX-P444	$113	4MB N/A $191

Panasonic LaserPartner 4450i, 4420

2MB	KX-P441	$129	4MB N/A $189

Panasonic LaserPartner 4451

2MB	KX-P442	$149

Texas Instruments MicroLaser, XL

1MB	2555739-0001	$46

Toshiba Page Laser 6

2MB	LS6-N80090	$120	4MB LS6-N80100 $190

PRINTER ACCESSORIES

Pacific Data Products

PacificPage 4 HPLJ 4	$269
PacificPage PE	$279
PacificPage PE/XL includes 4 MB HP, III, IIID, IIIP	$769
Pacific DirectNet (512K)	$339
Pacific Connect Xi (256k) 5 ports II, IID, III, IIID	$329
Pacific Connect Xi (256k) 7 ports IIISi, 4	$489
25 m Cool	$259

PERSONAL COMPUTER MEMORY

AST

Premmia

4MB	501159-001	$129	8MB	501159-002	$369
16MB	501159-003	$709	32MB	501159-004	$1299

Manhattan SMP

16MB	501143-001	$735

Bravo 386-SX, WS/286, 386

2MB	500510-002	$84	4MB	500510-008 $169

Bravo 3/25s

2MB	500710-004	$96	8MB	500824-002 $319

Advantage! Plus 486DX/33; DX2-50; DX2-66

4MB	500510-008	$148	8MB	500824-001 $319

Advantage! 386SX/20; 25, Advantage! Pro SX/25, Bravo 3/33s

2MB	500962-001	$89	8MB	500962-002 $289

Advantage Pro 486DX/33; SX/25, Bravo LC 4/25s; 33; 33s, 50d; 4/66d

2MB	500987-001	$59	4MB	500987-002 $159
16MB	500987-004	$579	32MB	500987-005 $1159

Premium 386/25, 33, 33T, Premium II 386SX/16, 20; 25

1MB w/MPU	500780-003; 002 $33

Advantage! 486/25; 33, 33s, SX20, Bravo 4/33; 486/25; Premium 4/25, 33TE, Server SE 4/33

2MB w/MPU	500718-004; 780-005 $69

Premium 386/33T, 386SX/16, Premium II 386SX/20; 25

4MB w/MPU	500780-004 $179

Advantage! 486/25, 33, 33s; SX20, Power Premium 3/33, 4/33, 33s, 50d; 66d, Premium 386/33TE, 486/25, 25E, 25TE; 33, 33E, 33TE, Premium II 386/25, 33, 486/33, 486SX/20

Premium Server SE 4/33

8MB w/MPU	500780-001 $349

IBM

AMBRA Enterprise 386, Hurdle 386, Sprinta 386 (all models)

1MB	N/A	$94	8MB	N/A	$329

AMBRA Enterprise 486, Hurdle 486, Sprinta 486 (all models)

4MB	N/A	$195	16MB	N/A	$659

PS/1 286, 386SX

2MB	92F9935	$82	4MB	92F9694 $168

PS/1 Consultant, Essential, Expert models x43, x44, PS/Valuepoint all models except Cxx series

4MB	96F9290	$199	16MB	96F9291 $639

PS/1 Consultant, Essential, Expert models x76

16MB Kit	96F9291	$639		

PS/2 25/286, 30/286, memory adapter 1497259

2MB Kit	30F5360	$81

PS/2 35SX, LS, 40SX, 50Z, 55SX, LS, 65SX, LS, 70, XStation

1MB	6450603	$39	2MB	6450604 $76

PS/2 70-A21, A61, B21, B61, PS/1 Consultant, Essential, Expert models x11, x13, x14, PS/Valuepoint Cxx series

2MB	6450608	$76

PS/2 35SX, LS, 40SX, 55SX, LS, 65SX, LS, XStation, PS/Valuepoint Cxx series, adapter board 34F3011 or 34F3027

4MB	34F2933 or 87F9977	$181		

PS/2 35SX; LS, 40SX, PS/Valuepoint Cxx series

8MB	6450129	$354		

PS/2 90 XP, 95 XP, P75 (pair), 56, 57 (all), PS/1 Pro M2123

2MB	6450902	$76

PS/2 90 XP, 95 XP, P75 (pair), 56, 57 (all), PS/1 Consultant, Essential, Expert models x11, x13, x14, PS/1 Pro M2123, RS/6000 POWERstation/POWERserver 220 series

4MB	6450128	$181	8MB	6450130 $354

Take a Look at these Savings!

SYSTEM	MEMORY SIZE	MFG. PART	MFG. PRICE	FSI PRICE
TI 4000	4MB	2581265-001	$279	$182
Toshiba T6400	8MB	PC-PA2005U	$559	$333
IBM PS/Valuepoint	8MB	6450130	$625	$354
Compaq ProLinea 433	8MB	141685-001	$499	$354
AST Bravo 4/33	8MB	500780-001	$469	$334

First Source International offers you savings of over 60%! We stock only the top memory brands such as Paragon and Kingston. Don't buy your memory anywhere else, CALL THE UPGRADE EXPERTS TODAY!

Compaq

ProLinea 3/25s; 3/25zs

2MB	141730-001	$89	8MB	141742-001 $319

ProLinea 4/25s, 4/33, 4/50

2MB	141682-001	$39	2MB	141683-001	$76
4MB	141684-001	$181	8MB	141685-001	$354

DeskPro 386-20, 20e, 25

4MB Module	113132-001 $180
4MB Board	113645-001 $244

DeskPro 386s/16

4MB Module	112534-001 $180
4MB Board	113634-001 $255

DeskPro 3/25; 33; 4/25S, 33; 66; 286M, 386M; 386SX/20; 20N, SystemPro LT Series, ProSignia PC Server 486/33; DX2/66

Portable 486c, M Series expansion boards

1MB	118688-001	$39	2MB	118689-001	$76
4MB	118690-001	$181	8MB	112877-001	$354

ProSignia PC Server 486/33; DX2/66

16MB	149320-001	$649	32MB	149147-001 $1280

SystemPro XL (486-50)

16MB	136816-001	$729	32MB	136817-001 $1409
64MB	N/A	$2589	128MB	139918-001 $5943

DeskPro 386-33, 486-33, SystemPro, SystemPro E series

2MB	115144-001	$99	8MB	116561-001 $379

DeskPro 386M, 486M, SystemPro LT, System Pro E series

2-4MB Board w/2M	129160-001 $275

DeskPro 386/33L, 486/33L, SystemPro

6 Socket Brd w/2MB	116569 + 115144-001 $309

Dell

Power Desktop 3250, 325P, 3330, 333P, 433P, 486P, 486D

1MB	310-2505	$39	4MB	310-2507 $181

Power Desktop 486P, 486D

16MB	310-2625	$640

PowerLine Workstation 420; 425; 433; 450E/2, 466DE

2MB	310-2466	$76	4MB	310-2467 $181
8MB	310-2468	$354	16MB	310-2469 $640

PowerLine Workstation 420; 425; 433; 450E/2, 466SE

32MB Kit	310-2630	$1280

Performance T, L, & M series

4MB	310-3325	$181	16MB	310-3327 $640

Performance ME series

4MB	310-3334	$152	8MB	310-3335	$362
16MB	310-3336	$709	32MB	310-3337	$1280

Hewlett-Packard

Vectra QS/165; 20PC, RS/20; 20C; 25, 25C

4MB Kit	D1542 or 1642A	$189

Vectra 386/16M, 386/20M, 386/25M PC

2MB	D2406A	$92	8MB	D2404A $310

Vectra 486PC, 25T, 33T, 486s/20; 486/25M; 33M; 50M; 66M

2MB	D2381A	$76	8MB	D2152A	$354
4MB	D2156A/51A	$181	16MB	D2676A	$649

Vectra 386/25, 486/25U, 486/33U, 486/50U; 486/66U

2MB	D2381A	$76	8MB	D2152A $354

Vectra 486/25N, 486/33N 486s/50N; 486/66N

16MB	D2676A	$640

Vectra 386/33N; 33NI

2MB	D2714A	$92	8MB	D2715A $310

IBM Continued

PS/2 80-111; 311; 121; 321; 081, 161

2MB	6450379	$183

PS/2 80-A21; A31; A16

4MB	6451060	$119

Expansion boards for 50, 50Z, 55SX, 60, 65SX

2-8MB w/2MB	1497259	$199
4-16MB w/4MB	6450609	$379

Expansion boards for all models 70, 80

2 14MB w/2MB	34F3077	$326
4-16MB w/4MB	34F3011	$317

NEC

Image 425, 433, 466

4MB	410-12002	$181	16MB	410-12003 $647

Ready 425, 433

4MB	N/A	$195	16MB	N/A $649

PowerMate 386/33; Express Fe, e series

4MB	OP-410-6205	$181	16MB	OP-410-6206 $640

PowerMate 286/12; SX/16, SX/20

2MB Kit	OP-410-8103	$96

PowerMate 386SX/20; 20w; 16; 25c 486/50; 486/33i

8MB Kit	OP-410-2101	$319

PowerMate SX Plus

2MB	N/A	$235
4MB	N/A	$318

PowerMate SX/20

2MB CPU Upgrade	OP-410-8101	$159
2MB Exp. Board	OP-410-8102+8103	$180

PowerMate 386/20; 25

2MB	APC-H655	$229
8MB	APC-H656	$408

PowerMate 386/33L 486/25E

2MB	OP-410-5101	$165

Zenith

Z-300/400 Series Plus, Z-420/SX, Z-425/SX, Z-433/DX, Z-433/SX

4MB	ME-100	$181
16MB	ME-90	$640

Z-Server 425SE, 433DE, 450DE

4MB	ME-432	$152
8MB	ME-102	$362
16MB	ME-442	$708
32MB	ME-92	$1280

Z-Station 325Sb, 325Sn, 420SEb; Sk; Sn, 425Sb, 433Deb, 433Dn, 450DEn

1MB	ME 70	$39
4MB	ME-100	$181

Zenith Z 386/20; 25; 33, 33E

1MB	ZA3800ME	$39
4MB	ZA3800MK	$181

Zenith Z-386SX/20, 286LP+, Z-15

2MB Kit	Z-605-1	$92

Zenith 486/33ET, 25E

4MB	ZA4200M2	$181
16MB	ZA4200MB	$640

NEXT DAY SHIPPING $5.00

LAPTOP & NOTEBOOK MEMORY

Apple

PowerBook 140, 145, 170, 160, 180	4MB	$169
	6MB	$263
PowerBook 165c, 180c	4MB	$195
	8MB	$356
PowerBook Duo 210, 230	4MB	$157
	8MB	$299

AST

PowerExec 4/25SL	4MB	$179
	16MB	$769
PowerExec 3/25SL, 3/25SL-C, EL	4MB	$189
	16MB	$769
Premium Exec 286, 386SX/20; 25; 25C	4MB	$149

Compaq

Contura 3/20, 3/25, 3/25c	4MB	$169
	8MB	$309
Contura 4/25 series	4MB	$179
	8MB	$359
LTE 286	4MB	$129
LTE 386S/20	4MB	$179
LTE Lite 20; 25; 25c, 25e	4MB	$179
	8MB	$295
LTE Lite 4/25c	4MB	$199
	8MB	$359
SLT 386s/20	4MB	$199

IBM

AMBRA Trakia	2MB	$112
ThinkPad 300	8MB	$369
PS/2 CLS25X and ThinkPad 700,	4MB	$209
700c, 720, 720c	8MB	$389
ThinkPad 710T	4MB	$189
	8MB	$319
N51 Notebook (All)	2MB	$69
	4MB	$189
L40SX, N33SX, PS/Note 182	4MB	$185
L40SX, PS/Note 182	8MB	$359
PS/Note N45SL	2MB	$99

NEC

UltraLite Versa (all models)	4MB	$229
	8MB	$449
UltraLite & Cellular Workstation SX/20	2MB	$147
	8MB	$309
UltraLite III, SL/25C	8MB	$359
UltraLite SL/20, SL/20P	6MB	$259

Texas Instruments

TravelMate 3000 (all models)	2MB	$79
TravelMate 4000 (all models)	4MB	$189
TravelMate WinSLC/25	2MB	$129

Toshiba

T1000SE/LE/XE; 2000, 2000SX; Sxu,	2MB	$99
T2200SX, T1800 Series	4MB	$179
	8MB	$329
T1200XE, 1600, 3100E	2MB	$89
T3100SX, 3200SX, SXC	2MB	$79
	4MB	$149
T3200	3MB	$129
T3300SL	4MB	$169
	8MB	$369
	16MB	$935
T4400, T6400 (all models)	4MB	$209
	8MB	$359
	16MB	$699
T1900, T4500, T4600, (all models)	8MB (3.3 volt)	$459
	16MB (3.3 volt)	$1319
T5100	2MB	$89
T5400, T5200; T5200C, T8500	2MB	$89
	8MB	$329

Zenith

Z-Lite 320L	2MB	$139
Z-Note 320L, 320Lb, 325L, 325Lc	2MB	$108
	8MB	$384
Z-Sport 4205, 4255	4MB	$188
Z-Sport 3255	2-6MB	$106
	4MB	$194
MastersPort 386SL, SLC, SLa	2MB	$90
MastersPort 386SX	2MB	$89
SuperePort SX, 286e, SlimsPort	2MB	$139
SuperePort 286e, SlimsPort	4MB	$279

CALL THE UPGRADE EXPERTS

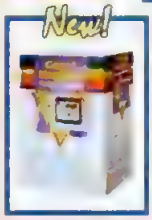
& MUCH MORE . . .

COREL

CorelDRAW 4!

CorelDraw 4 illustration, charting, phot-paint tracing/OCR, presentation and animation capabilities, plus hundreds of fonts and thousands of clipart images. With CD

$369



Corel Ventura
The Best in Publishing!

Corel Ventura 4.2 features faster font loading and support for Adobe Acrobat. Ventura Business Publisher 4.2 Features Separator and Ventura Scan plus 75 templates, over 600 fonts and more than 10,000 clipart images

$169

VIDEO CARDS

Diamond

Stealth Pro 1MB	$289
Stealth Pro 2MB	$349
Stealth VLB 1MB	$249
Stealth VLB 2MB	$369
Viper VLB 2MB	$409
Stealth 24 1MB	$169

ATI

Graphics Ultra Plus 2MB	$239
Graphics Ultra Pro 2MB	$359

EXPANSION BOARDS

BocaRom AT Plus
2-8MB memory board for 286 & 386 machines. Conventional, expanded (LIM EMS 4.0) and/or extended memory.

Including 2MB	$160	Including 4MB	$244
Including 6MB	$327	Including 8MB	$411

BocaRom 8-bit
Up to 2MB of expanded memory for IBM PC/XT/ATs, PS/2 Models 25, 30, 30/286 & compatibles.

Including 1MB	$131	Including 2MB	$181

BocaRom AT I/O Plus
2-4MB memory board, with 1 ser and 1 par port. Includes cables

Including 2MB	$169	Including 4MB	$269

COMPUTER ASSOC.

Simply Accounting

CA Simply Accounting™ is an entry-level, fully integrated graphical accounting system designed for small businesses. Its quick setup, time-saving and no-nonsense features allow for fast and complete reporting. CA-Simply Accounting offers an easy to learn, consistent menu structure, automatic transaction posting, pop-up list features for quick reference during transaction entry, password security and Dynamic Data Exchange

ORDER NOW! $69

MEGAHERTZ

For Laptop and Notebook Systems.

PCMCIA 2.0 Data/Fax with XJACK

14,400bps FAX/Modem	$329
24/9600bps FAX/Modem	$209

Internal Data/Fax w/MNP-5, V.42/V.42bis

14,400bps FAX/Modem	$419
96/9600bps FAX/Modem	$399
24/9600bps FAX/Modem	$209

Pocket Modems for any serial port

14,400bps FAX/Modem	$319
96/9600bps FAX/Modem	$275

FAX/MODEMS

intel

Faxmodem 144e 14,400bps V.32/V.42 Data/Fax, ext	$199
Faxmodem 144i 14,400bps V.32/V.42 Data/Fax, int	$179
Faxmodem 96e 96/9600bps V.32/V.42 Data/Fax, ext	$169
Faxmodem 96i 96/9600bps V.32/V.42 Data/Fax, int	$149

BOCA RESEARCH INC

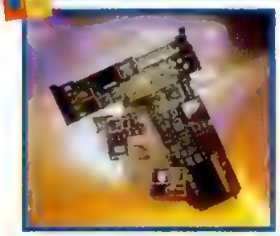
PC MAGAZINE EDITORS' CHOICE

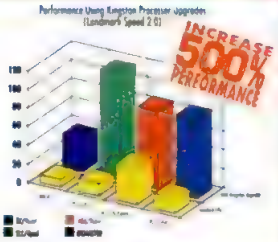
External 14,400bps data, 14,400 send and recieve fax. V.32, V 32bis, V.42bis, MNP5 protocol, throughput to 57,600bps. Includes communications software for DOS and Windows! $169

COMPUTER PERIPHERALS, INC.

VIVa Internal 14,400bps V.32/V.42 Data/Fax	$159
VIVa External 14,400bps V.32/V.42 Data/Fax	$189
VIVa Internal 24/9600bps Data/Fax	$69
VIVa External 24/9600bps Data/Fax	$95

KINGSTON TECHNOLOGY





Upgrade your 286 to a 386 or 486!

Kingston processor upgrades provide an easy and cost effective way to give your system the processing power it needs for todays graphical user interfaces. All of Kingston upgrades are tested fully software compatible by the National Software Testing Laboratories. If you are looking for a way to improve the performance of DOS, Windows, OS/2, and other business, graphic and CAD/CAM programs whithout purchasing a new system, look to Kingston Technology!

SX/Now! 386 CPU upgrade

25MHz (SX)	$169	33MHz (SX)	$199

SLC/Now! 386 or 486 CPU upgrade

25MHz (SLC)	$219	50MHz (SLC)	$399

486/Now! 486 CPU upgrade

25MHz (SX)	$399	33MHz (DX)	$579

MCMaster 486 CPU and up to 64MB of RAM

25MHz (SX) OMB	$699	With 4MB add	$181
33MHz (DX) OMB	$959	With 8MB add	$354

ADI

"Mainstream Choices!"

MicroScan/ADI

- MicroScan 3E+, 14", 0.28mm 1024x768 NI @ 72Hz
  Microprocessor-based digital controls, 30K - 60KHz $359
- MicroScan 4G, 15" FST, 0.28mm, 1280x1024 NI @ 60Hz
  Microprocessor-based digital controls, 30K - 64KHz $449
- MicroScan 5A, 17" FST, 0.26mm, 1280x1024 NI @ 60Hz
  Microprocessor-based digital controls, 30K 64KHz $869

NETWORKING

Kingston Technology's EtherEx Adaptor includes both BNC (10Base2) and RJ-45 (10Base-T) connectors which allow a laptop or notebook PC to access a LAN via the PC's parallel port.

yes Plug and Play

Pocket LAN Adapter $239

Network Interface Cards:

EtherEx 10base-T	$89
EtherEx 10base2	$119
EtherEx 10base-T & 10base2	$129

Network Concentrator:

EtherEx 10base-T 8 port concentrator	$349

HARD DRIVES

Seagate

106MB ST3120A, 15ms, 1H, 3.5" IDE	$189
with 16-bit kit	$209
130MB ST3144A, 15ms, 1H, 3.5" IDE	$199
with 16-bit kit	$219
260MB ST3290A, 16ms, 1H, 3.5" IDE	$279
with 16-bit kit	$299
1420MB ST41650N, 15ms, 9H, 5.25" SCSI	$1899
with 16-bit kit	$2049

COPROCESSORS

Intel Math Coprocessors

80387SX 16, 20, 25MHz	$85
80387DX 16, 20, 25, 33MHz	$89
80387SL Mobile 16, 20, 25MHz	$85

Intel OverDrive Processors

486SX20 with socket	$325
486SX25 with socket	$438
486DX25 without socket	$439
486DX33 without socket	$554
486DX33 or 486SX33 with socket	$555

Cyrix

Cx486Dx²-16/32	$269
Cx486Dx² 20/40	$319
Cx486Dx² 25/50	$369
Cx486Sx² 16/32	$269
Cx486Sx²-20/40	$369

MONITORS

Hitachi

SuperScan 15, 1024x768 NI @ 70Hz, .28mm	$469
SuperScan 17, FST, 1280x1024 NI @ 60Hz, .28mm	$969
SuperScan 20s, FST, 1280x1024 NI @ 60Hz, .31mm	$1429

ADI

MicroScan 2E, 14" .28 dot pitch, 1024x768 NI	$289
MicroScan 3E+, 14" .28 dot pitch, 1024x768 NI @ 72 Hz	$369
MicroScan 3G, 14" .28dot pitch, Hi-res. RGB color adjust	$389
MicroScan 4G, 15" .28 dot pitch, Flat, Hi-res monitor	$449
MicroScan 5A, 17" .26dot pitch, Flat, Hi-res, mem. degauss	$869

MONEY BACK 30 DAY GUARANTEE

WE SET THE STANDARD:

- 100% COMPATIBLE IN FORM, FIT, AND FUNCTION
- ALL PRODUCTS USER INSTALLABLE
- INSTALLATION INSTRUCTIONS INCLUDED
- TOLL-FREE TECHNICAL SUPPORT
- THOUSANDS OF ITEMS IN STOCK
- MANUFACTURER'S WARRANTIES
- CORPORATE PO'S, APO/FPO'S WELCOME
- GOVERNMENT AND EDUCATIONAL PRICING
- INTERNATIONAL ORDERS WELCOME
- SPECIAL VOLUME PRICING
- SAME DAY SHIPPING
- OVERNIGHT DELIVERY AVAILABLE
- NO SURCHARGE ON CREDIT CARDS

DON'T SETTLE FOR LESS!

CALL FOR ANY MEMORY UPGRADE NOT LISTED

WE STOCK MEMORY UPGRADES FOR OVER 1980 COMPUTERS AND PRINTERS

TOLL FREE FROM THE U.S. OR CANADA
800-254-9866

INTERNATIONAL ORDERS
714-448-7750

FAX ORDERS
714-448-7760

Business hours:
Monday - Friday, 8am-5pm, P.S.T.
Saturday, 9am-3pm, ORDERS ONLY

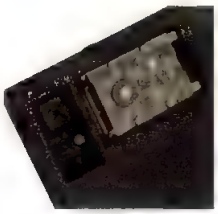
First SOURCE International

Mail or fax orders to:
First Source International, Inc.
7 Journey
Aliso Viejo, CA 92656

800-254-9866

CIRCLE 014 ON READER SERVICE CARD

When The Competition Wants To Know What's New ...
They Read Our Ad



Removable Hard Drive
Fax/Modem Option

Local Bus Video

PCMCIA Type III Slot

Built In Center Trackball

15 Million Winmarks

5300 Shown Here Fully Upgradable To
• 66MHz • 32MB Ram • Active Matrix Display • Removible Hard Drive

Ports 2S, 1P, Video, 1 PCMCIA, 1M/K 1/Fax Modem

Optional Docking Station

Memory Upgrades
Made Easy

3.3 Volt Compatible

3.3 Volt System

3.3 Volt System

TravelPro 5300

• Choice of Upgradable Intel CPU's 486SX-25, 486DX-33, 486DX2-50 & 486DX2-66; including 3.3v processors • Available in Upgradable Active Matrix, Dual Scan Passive Matrix or Monochrome Displays • Local Bus Video • Fastest Performance of any Notebook for True Desktop Power • Built-In Center Trackball • PCMCIA Type III • 4MB Ram Expandable to 32MB • Upgradable CPU, RAM & Display • Over 3 hours of Battery Life • 5.9 lbs. Mono - 6.3 lbs. Color • Removable 80MB Hard Drive (120 - 340MB Avail) • Optional Internal Fax/Modem •Optional Docking Station

5325 25MHz Active Matrix	$3295
5325 25MHz Dual Scan Passive	$2295
5325 25MHz Monochrome	$1675

TravelPro 7525

• Low Power CPU 486SL-25 CPU DX-33 Speed • 64 Grayscale Monochrome Display • Large Ergonomic 25mm Built-In Center Trackball with palmrest • PCMCIA Type III Expansion Slot • Up to 4 hours of Battery Life • 6.3 lbs. total weight with battery • 4 MB RAM - Expandable to 20MB • Removable 120MB Hard Drive (120 - 340MB Available)

Our Lowest Price Ever!
7525 25MHz Monochrome
$1650

TravelPro 7325

• Low Power CPU (P-23) 486SX-25 Processor • Available in Dual Scan Passive Color or Monochrome Display • Large 25mm Built-In Center Trackball with palmrest • Over 3 hours of Battery Life • 5.9 lbs Mono - 6.3 lbs. Color • 4 MB RAM - Expandable to 12MB • Removable 80MB Hard Drive (120 - 340MB Available) • Built-In 9600/2400 Internal Fax/Modem

7325 Dual Scan Color	$1995
7325 Monochrome	$1495

ProBook

• Upgradable Intel 486DX-33, DX2-50 or DX2-66 CPU (Probook 5 only) • 10" 64 Grayscale Mono Display • Built-In Center Trackball • 5.5 lbs. Including Battery • Upgradable to 8MB RAM • 80MB Hard Drive (120 - 340MB Available) • Optional Internal Fax/Modem

ProBook 5 / DX-33 4MB/80	$1595
ProBook 4 / 486-33 4MB/80	$1250
ProBook 4 / 486-33 2MB/80	$1195

What the competition doesn't want you to know about AMS...

Here at AMS we stay on the cutting edge of technology to bring you the best selection of the newest features available in mobile computing. We've listened to our customers and know what they want; more powerful CPU's, better expandability, easy upgradability, longer battery life, lightweight design, larger capacity hard disk storage, built-in pointing devices, docking stations and an eye of ergonomics and ease of use. All backed by the industries best standard and premium support services.

- **FREE SHIPPING Via FEDERAL EXPRESS Economy**
- **30 Day Money Back Satisfaction Guarantee**
- **Lifetime Toll-Free Technical Support**
- **1 Year Warranty on Parts & Labor**
- **24 Hour On-Line BBS**

intel inside

VISA

Corporate, Dealer & Goverment Pricing Available

1-800-886-2671

AMS

We accept MC Visa and Amex with no surcharge.Prices do not reflect sales tax charges or shipping/handling. Free shipping services are sent via FEDEX® economy and are free within the continental U.S. All return shipments require an RMA number prior to shipment and must be sent pre-paid, insured and in original packaging. Damages due to negligence, abuse or misuse are not covered by the Money Back Guarantee. Returns made after the 30 day money back guarantee will be charged for open software and will be assessed original shipping costs invoiced or paid by AMS. Returns made after 30 days will be subject to a restocking charge. AMS is not liable for errors in typography or photography. Specifications and prices are subject to change without notice. The Intel Inside logo is a trademark of Intel Corporation. Federal Express trademarks used by permission. All logos and trademarks are registered trademarks of their respective companies.

4801 Little John Street, Unit A, Baldwin Park, CA 91706
Tel: (818) 814-8851 • Fax: (818) 814-0782
Hours of Operation: 6:30am - 6:00 pm M-F
9:00am - 3:00pm Saturday PST

CIRCLE 235 ON READER SERVICE CARD

Super **Selection**

VALUELINE

Since 1979

WHERE MORE THAN JUST THE PRICE IS RIGHT

Great **Service**

Big **Savings**

- OVER 15,000 NATIONAL BRANDED PRODUCTS
- OVER 4,000 SOFTWARE TITLES

(800) 700-1000

24 HOUR FAX LINE (708) 677-7168

IN ILLINOIS (708) 933-1100

IBM PS/1 All NEW!
486SX/25 129HD $999
486SX/33 170HD 1199
486DX2/50 340HD 1750
[illegible] 1950
486SX/25 170HD MultiMedia 1599
486DX2/50 253HD Mini Tower 1649
Monitor not included

TOSHIBA

T1900/120	$1449	T4600C/200	$3949
T1900/200	1649	[illegible]	[illegible]
T1900C/120	2049	T6600C	5949
T1900C/200	2249	T6600C/CD	6449
T4600/120	2199	T6600C CDV	7449
T4600/200	2499		

AST

Bravo LC 486DX/33 123HD ....[illegible]
Bravo LC 486DX/33 213HD 1449
Bravo MT 486DX/33 173HD 1449
Bravo MT 486DX/33 343HD 1847
Bravo Notebook 486/25SX 123HD 1898
Bravo Notebook 486/125SX 173HD 1796
Active Notebook 486C/25SX 173HD 3195

EPSON

LX810	$169	LQ1170	$599
FX870	269	AP2250	119
FX1170	366	AP3250	179
LQ1070+	369	DFX5000	1339
LQ570+	245	DFX8000	2249
LQ870	449	Stylus800	279
LQ2550	889	ActionLaser 1500	849

COMPUTERS

PACKARD BELL

486SX/25 170HD $799
486SX/25 210HD 999
486SX/25 170HD Multimedia 1199
486SX/25 210HD Multimedia w/TV3 1699
486SX/33 245HD Tower 1199
486DX2/33-66 245HD 1575
486DX2/33-66 450HD Tower 1695

LEADING EDGE

INCLUDES 14" VGA COLOR MONITOR
486SLC/33 120HD w/ 42 VGA $899
486SLC/33 170HD w/ 39 SVGA 1099
486SLC/33 245HD w/ 28 SVGA 1199
486DX/33 213HD w/ 28 SVGA 1499
486DX/33 260HD w/ 28 SVGA-VL 1599

Canon

NoteJet 4/25 120HD with Built-in Printer $2299
NoteJet 4/25 180HD with Built-in Printer 2699

TEXAS INSTRUMENTS

TM4000E DX2/50 120HD Mono $2575
TM4000E DX2/50 200HD Mono 2875
TM4000 DX/25 120HD Mono 2032
TM4000 DX/25 200HD Mono 2315
TM4000E DX2/50 200HD Color 3425
TM4000E SX/25 120HD Color 2575

PRINTERS

OKIDATA

ML184 Turbo	$235	ML321	$414
ML380	205	ML521	485
ML320E	292	OL400E	499
ML520	363	ML591	559
ML590	414	OL850	1239

Panasonic

2023	$193	4430 Laser	$659
2180	165	2624	359
2123	232	3123	279
1654	579	3124	333
2124	304	3624	388

Canon

BJ230	$399	BJC600	$579
BJ200	289	430 Laser	589

HEWLETT PACKARD

DeskWriter for Macs $269
DeskWriter C Color Printer for Macs 379
DeskWriter 550C Color Ptr for Macs 589
DeskJet 310 Portable for IBMs 309
DeskWriter 310 Portable for Macs 309

LEXMARK

PPSII 2380+ Narrow 9-Pin $325
PPSII 2381+ Wide 9-Pin 449
PPSII 2390+ Narrow 24-Pin 325
Color Jetprinter PS 2599
4037 5E LED Printer 699
4039 Laser Model 16L 2699
4039 Laser Model 12R 1665
4039 PostScript 10RD 1799
4039 PostScript 10R 1339
ExecJet II 4076 Ink Printer 299

QMS

Colorscript 1000 Laser $11350
HammerHead 860 Laser 4085
PS420 Laser 1862
Colorscript 210 4387

HARD DRIVES

CONNER

84MB 19MS 3.5" HH IDE $169
170MB 17MS 3.5" HH IDE 199
250MB 14MS 3.5" HH IDE 245
340MB 14MS 3.5" HH IDE 319
545MB 10MS 3.5" HH IDE 645
1.37GB 10MS 3.5" HH SCSI 999

Seagate

ST251-1 43MB 5.25" MFM $236
ST351/AX 42MB 3.5", IDE 123
ST3144A 131MB 3.5", IDE 199
ST3243A 214MB 3.5", IDE 215
ST3390A 341MB 3.5", IDE 329
ST3550A 452MB 3.5", IDE 476
ST41200N 1.05GB SCSI 969

Maxtor DRIVEN BY THE BEST

ALL NOVELL READY HARD DRIVES—CALL!
7131A 131HD IDE $185
7213A 213HD IDE 229
7345A 345HD IDE 319
MXT540A 540HD IDE 799
PO-125 1.02GB SCSI 959

MODEMS & COMMUNICATIONS

US Robotics

14.4 External Sportster $169
14.4 External Sportster/Fax 179
14.4 Internal Sportster 149
14.4 Internal Sportster/Fax 169
9600 External Sportster/Fax 159
9600 Internal Sportster/Fax 139
Worldport 9696 w/Fax 239
Worldport 14.4w/Fax 259

PRACTICAL PERIPHERALS

2400 V 42bis w/9600 Fax Internal $88
2400 V 42bis w/9600 Fax External 108
14.4 Internal V 42 bis w/Fax 176
14.4 External V 42bis w/Fax 199
14.4 Send/Receive Pocket 325
9600 External w/Fax V.32 174
9600 Internal w/Fax V.32 164

Hayes

ACCURA 2400B Internal $62
ACCURA 14.4 + Fax144 Internal 219
ACCURA 96 + Fax96 Internal 199
OPTIMA 14.4 + Fax14.4 Int./Ext. 369
OPTIMA 96 V.32 + Fax96 Int./Ext. 349

intel

9600 External V.42 bis $448
SatisFAXtion 100 2400B 95
SatisFAXtion 400E 14.4 349
SatisFAXtion 400 Internal 14.4 274
14.4 Internal Fax/Modem 145
14.4 External Fax/Modem 169

TAPE BACK-UP & MEDIA

COLORADO

JUMBO 120 ....$99
JUMBO 250 178
TRAKKER 120MB Portable 265
TRAKKER 250MB Portable 339
Powertape 2.0GB Internal 934
Powertape 2.0GB External 1119

IOMEGA

BERNOULLI PC Powered 90 ....$449
BERNOULLI PC Powered 90 Pro 499
BERNOULLI Insider 150 549
BERNOULLI Insider 90 Pro 449
TAPE 250MB Back-Up 199

SYDOS

Sydos Pro Note 42MB Parallel $505
Sydos Puma 88MB Parallel 437
Sydos Marlin 105MB Int IDE 579
Sydos 88MB Ext. SCSI w/Adapter 583
Sydos 88MB Int SCSI w/Adapter 492

3M

DC2120XIMAT $17
DC 600A 14
DC 6250 250MB 19
DC 6525 24
3.5 Diskettes DS/HD Fmt. 8
5.25 Diskettes DS/HD Fmt 6
MAGNUS 1.2 34

BATTERY BACK-UPS

APC

BACK UPS 250 ....$94
BACK UPS 400 154
BACK UPS 600 254
BACK UPS 900 369
BACK UPS 1250 485
SMART 600 349
SMART 900 549
SMART 1250 675

TRIPP LITE

BC 250	$92	OMNI 500 LAN	$242
BC 400	152	OMNI 600 LAN	279
BC 500	170	OMNI 750 LAN	379
BC 500 LAN	189	OMNI 900 LAN	449
BC 600 LAN	240	OMNI 1250 LAN	549
BC-750 LAN	279	LC 1200	125
BC-900 LAN	329	Power Miser	49
BC-1250	439		

CD ROM & OPTICAL

SONY-CDU-56110 ....$369
SONY-CDU-781110 499
NEC-CDR 400 3XP Portable 445
NEC-CDR 500 3XI Portable 492
NEC-CDR 600 3XE Portable 586
TEXEL-CD ROM Int-Kit 439
TEXEL-CD ROM Ext-Kit 514
TEXEL-CD Multimedia Business Bundle 999
CHINON CD5535 Kit Int. 399
CHINON CD5535 Kit Ext. 499

MEMORY UPGRADES

VALUELINE STOCKS KINGSTON & VIKING MEMORY FOR EVERY COMPUTER. PRICES CHANGE, SO CALL US FOR YOUR BEST PRICE!

FAX MACHINES

Sharp Fax 184 ....$349
Canon Fax 50 399
Hewlett-Packard Fax 900 775

MULTIMEDIA, SOUND & CD'S

MEDIA VISION

Pro Audio Spectrum 16 ....$169
Fusion CD Kit Int. 397
Double Fusion CD Kit 547
Pro Audio 16 Basic 128

CREATIVE

Sound Blaster Deluxe $79
Sound Blaster Pro-Deluxe 119
Sound Blaster MCD 16 168
Sound Blaster SCSI 16 197
Sound Blaster MCD ASP 218
Sound Blaster SCSI ASP 239

Labtec

Labtec CS 150 Speakers $19
Labtec SS-700 Speakers 36
Labtec CS 550 Speakers 29
Labtec CS-180 Shielded Speakers 24
Labtec CS 1000 Stereo Speakers 79

ALTEC

ACS 200 Speakers $199
ACS 300 Speakers 285
ACS 50 Speakers 74
ACS 100 Speakers 126
AC10 Computer Audio Controller 179

TURTLE BEACH

Turtle Beach Multisound $499
Wave Card Synthesizer 154

Sound Galaxy BXII $59
Sound Galaxy NX Pro 16 159
Sound Galaxy NX Pro-Extra 8 119

VGA MONITORS

NEC

NEC Multisync 2A $309
NEC Multisync 5FGE 1079
NEC Multisync 6FG 2259
NEC 14" SVGA .28DP 349

SONY

Sony 14" VGA .25DP CDP1320 ....$349
Sony 14" Multiscan MDL 1430 599
Sony 17" Color .25DP MDL 1730 999
Sony 1730SE 17" VGA 1199
Sony 20" Multiscan MDL 2036 2080

LEADING EDGE

Leading Edge 14" VGA .42DP $199
Leading Edge 14" EVGA .39DP 239
Leading Edge 14" EVGA .28DP 279
Leading Edge 14" EVGA .28DP NI 299

Packard Bell 14" SVGA .39DP $249
Packard Bell 14" EVGA .28DP 329

Samtron 14" VGA Mono Flat $139
Samtron 14" VGA .28DP 319

NETWORKING

NetWare Version 4.01

5 User 3.5"	$875	100 User 3.5"	$5565
10 User 3.5"	1965	250 User 3.5"	9945
25 User 3.5"	2975	500 User 3.5"	16,796
50 User 3.5"	3968	1000 User 3.5"	30,518

NetWare Version 3.12

5 User 3.5"	$599	50 User 3.5"	$2540
10 User 3.5"	1375	100 User 3.5"	3488
25 User 3.5"	1880		

NetWare Version 3.11

5 User 3.5"	$635	50 User 3.5"	$2448
10 User 3.5"	1229	100 User 3.5"	3460
25 User 3.5"	1732	250 User 3.5"	6360

SFTIII Version 3.11

5 User	$1534	50 User	$4595
10 User	2382	100 User	6599
25 User	3199	250 User	11399

NE1000 Ethernet Coax Card $96
NE 2000 plus Ethernet Coax Card 105
NE3200 EISA Ethernet Coax Card 325

intel

Intel EtherExpress 16 ....$99
Intel EtherExpress 16C 119
Intel EtherExpress Flash 119

SMC

ULTRA 16-Bit Ethernet 10BT/Coax $104
ULTRA 16 Combo 121
PC-130 8-Bit ArcNet 67
PC-130E ArcNet Coax 97
Ethercard + Elite 8 bit Coax 94
Ethercard + Elite Coax/10BT 118

3Com

3C503 Etherlink II 8-Bit Coax $189
3C503 Etherlink Coax 157
3C503 Etherlink II 10BT 172
3C509 Etherlink III Coax 123
3C509 Etherlink III 10BT 129
3C509 Etherlink III MCA 10BT 238
3C579 Etherlink EISA Coax/10BT 226

VGA BOARDS

ATI Graphics Ultra Pro EISA 2MB $369
ATI Graphics Ultra +2MB 235

Hercules HG210 Graphite w/1MB $222
Hercules D301 Dynamite Pro ISA 164
Hercules D302 Dynamite Pro ISA 226

BOCA Super VGA w/512K $69
BOCA Super Accelerator w/1MB 119
BOCA Local Bus SXVGA w/1MB 126
BOCA Local Bus SXVGA w/2MB 184
BOCA Vortex VRAM w/2MB 16-Bit 325

Orchid Fahrenheit 1280+ $147
Orchid Celcius VLB 1MB 215

ADS VGA to TV Elite $254
ADS Video Clipper 319
ADS PC Primetime 356

WYSE TERMINAL

WYSE 30 Amber or Green $274
WYSE 55 Amber or Green 349
WYSE 60 Amber, Green or White 374
WYSE 150 Amber, Green or White 263
WYSE 160 Amber, Green or White 324
WYSE 185 Amber, Green or White 319
WYSE 325 Color 609
WYSE 370 Color 869

SPECIAL ORDER SERVICES — CORPORATE ACCOUNTS — FAST DELIVERY — CONVENIENT HOURS

(800) 700-1000

CIRCLE 343 ON READER SERVICE CARD

PCSources Says . . . Kenosha Computer Center offers some of the Best Buys in Mail Order!

EXPERIENCE THE KENOSHA DIFFERENCE

- *Over Six Years of Service*
- *Thousands of Satisfied Customers*
- *Terrific Technical Support*
- *Everyday Low Prices*
- *No Surcharge on Credit Cards*

KENOSHA COMPUTER CENTER
YOUR DIRECT SOURCE FOR VALUE AND SERVICE
CALL US TODAY!

KENOSHA COMPUTER CENTER

SALES LINE OUTSIDE WISCONSIN

1-800-255-2989

Shipping, customer service & technical assistance call

414-697-9595 ▪ FAX 414-697-0620

VISA, MASTERCARD, AMERICAN EXPRESS & DISCOVER

EPSON

FX 870	$259	FX 1170	$345
LQ 570+	$235	LQ 870	$425
LQ 1070	$355	LQ 1170	$589
DFX 5000	$1299	LQ 2550	$879

STYLUS 800 INKJET $279
STYLUS 300 INKJET $239
ACTION 1000 6PPM, 14 FONTS $579
ACTION 1500 6PPM, PCL5 ..... $639

ActionNote 486SLC/33
120mg, 4mg, FAX modem, trackball, DOS, Windows, 1 yr. on site wrnty. $1619

HEWLETT-PACKARD

LASERJET IV/IVM ..... $1369/$1929
LASERJET IVP/IVMP ..... $989/$1379
LASERJET IVL/IVML ..... $675/$1039
LASERJET IVSI/IVSIMX ..... $2989/$4499
JET DIRECT $399
2MG/4MG/8MG UPGRADE ..... CALL
IIP/IIC SCANNER ..... $719/$979
DESKJET 500/500C ..... $309/$409
DESKJET 550C $575
DESKJET 1200C/1200C/PS ..... $1369/$1939

OKIDATA

ML320/ML321 ..... $295/$415
ML520/ML521 ..... $369/$489
ML590/ML591 ..... $415/$569
ML380/ML395 ..... $209/$959
ML395C $1029
PM3410 ..... $1199
OL400E/OL410E 600DPI ..... $475/$699
OL810/OL830 ..... $899/$1089
OL850+ $1199
OKIDATA 400E 2MG $156

Panasonic
Office Automation

2023/1124i ..... $199/$229
2180/2123 ..... $169/$229
2124/2624 ..... $295/$359

Canon

"BubbleJet" Printers

BJ 10ex $239
BJ 200 ..... $255*
BJ 230 ..... $389
BJ 600C $589
BJC 800 ..... $1449
BJC 820 ..... $1579

BJC 600
Full 4 Color Process for a Multitude of Colors!
360 DPI, 240cps, 100 sheet auto feed, Canon, Epson & IBM emul. plus 2 year warranty

Innova NX M25-120
486SX-25 Notebook $1575
- 4 mg ram
- Fax Modem
- 120mg HD
- DOS Windows
- Built-in Trackball

NOTEJET 486 SLC/25
Built-in Bubblejet Printer
4 MG RAM, 2 PCMCIA SLOTS, DOS & WINDOWS
135 MG $2349 180 MG $2549

MODEMS & FAX MODEMS

PRACTICAL PERIPHERALS
PRACTICAL PER 14.4 POCKET $319
PRACTICAL PER 14.4 PCMCIA $295
PRACTICAL PER 14.4 INT/EXT ..... $195/$195

HAYES
HAYES 14.4 POCKET $299
HAYES 14.4 PCMCIA $269
HAYES OPTIMA 14.4 W/FAX $369
HAYES ACCURA 14.4 W/FAX $199

U.S. ROBOTICS
Sportster 14.4 Int $145
Sportster 14.4 Ext $165
Sportster 14.4 Int. w/fax $149
Sportster 14.4 Ext. w/fax $169
Dual Standard 16.8 ..... $659
World Port 14.4 Pocket $325
Intel Satisfaxtions Below

intel OVERDRIVE

PROCESSOR UPGRADES
- For any Intel 486 based system
- Improves system performance up to 70%
- Accelerates all DOS, Windows, OS/2 and Unix applications
- Cost effective upgrade to next generation CPU technology

Overdrive Upgrade SX20/25 ..... $285/$339
Overdrive Upgrade DX25/33 ..... $339/$495

HARD DRIVES & TAPES

SEAGATE & MICROSOLUTIONS
SEAGATE 120 MB 3144A $175
SEAGATE 260 MB 3290A $225
SEAGATE 452 MB 3550A $409
SEAGATE 1 GB SCSI 11200N $939
BACKPACK 170/250 MB ..... $375/$459
BACKPACK 250 MB EXT. TAPE $349

TAPE BACK UP

Colorado Tracker 250 ..... $319
Colorado Tracker 120 ..... $275
Colorado Jumbo 250 ..... $165
Colorado Jumbo 120 ..... $119
Colorado 2 GB EXT $1069
Colorado 4 GB EXT $1639
Qic 80 tapes $20

SOFTWARE

ALDUS PAGEMAKER $519
DBASEIV 1.5/2.0 ..... $415/$459
LOTUS 123 VER 2.4/3.4 ..... $279/$349
LOTUS FOR WINDOWS $299
MICROSOFT EXCEL/WINDOWS $289
MICROSOFT WORD/WINDOWS $299
NORTON UTILITIES 7.0 ..... $99
PARADOX 4.0 DOS $425
WORD PERFECT WINDOWS 6.0 ..... $269
ALL OTHER TITLES ..... CALL

TEXAS INSTRUMENTS

486 WINSX 120 ..... $1835
486 4000E SX/25 120MB Color $2119
486 DX2/40 200 MB Color $2889
486 DX2/50 Mono $2699
486 4000E DX2/50
200MB ACTIVE COLOR $3749
CALL FOR ALL OPTIONS

MONITORS

Mitsubishi Diamond Scan 15FS $479
Mitsubishi Diamond Pro 17" $1019
Mitsubishi HL 6955 20" $1759
Mitsubishi Diamond Pro 21FS $2149
NEC 3FGE/3V ..... $579/$499
NEC 4FGE $679
NEC 5FG/5FGP ..... $1245/$1339
NEC 6FG/6FGP ..... $2249/$2299
Nanao 340 IW/F550 I ..... $689/$995
Nanao T650 I $1675
Nanao T7601IW $2099
Viewsonic 15 ..... $429
Viewsonic 17 ..... $979
Viewsonic 20 ..... $1679
Viewsonic 21 ..... $1899
CTX 5468A/1451 ..... $249/$279
CTX 1560/1760 ..... $379/$719

GRAPHICS CARDS

ATI VGA WONDER XL 24 1MB $119
ATI GRAPHICS ULTRA+ 1MB $199
ATI GRAPHICS ULTRA PRO 1MB $329
DIAMOND Speedstar PRO 1 MB $129
DIAMOND STEALTH VLB 1MB $159
DIAMOND VIPER 2MB $389
ORCHID FAHRENHEIT 1280 1 MB $155
ORCHID FAHRENHEIT VA 1MB $179

intel

Satisfaxtion Fax Modems
200 2400 V.42/9600 Fax $199
400 int 14.4/14.4 Fax $259
400 ext 14.4/9600 Fax $295
FAX MODEM 14.4-14.4 int $159
FAX MODEM 14.4-14.4 ext $189
PC MCIA 24/96 ..... $179
PC MCIA 14.4/14.4 ..... $279
All Intel Networking Products ..... Call

MEMORY PRODUCTS

2MB IBM 30-286 ..... $125
2MB IBM PS1 386 ..... $129
4MB IBM THINKPAD 700.700C $229
4MB TOSHIBA 2000.2200.1850C $199
1&4 MB SIMMS ..... CALL
2 MB FOR PANASONIC 4410 ..... $125
2 MB FOR OKI 400 ..... $125
2 MB FOR EPSON ALII $129
2 MB FOR H-P IIP.IIIP&III $109
BOCA RAM Ok FOR AT OR PSII $99
FOR ALL OTHER MODELS & MFG ..... CALL

CO-PROCESSORS & DOUBLERS

INTEL
80287 XL/XLT $75
80387 SL $75
80387 SX $75
80387 DX $85

CYRIX
80387 SX-33 ..... $75
80387 DX-40 ..... $85
CX486DRx2-16/32 ..... $259
CX486DRx2-20/40 ..... $295
CXD486DRx225/50 ..... $335

BATTERY BACKUPS

AMERICAN
250/400 ..... $99/$155
450/600 ..... $185/$259
900/1250VX ..... $369/$485
SMART UPS 400 ..... $289
LINE R 1250 POWER COND. $189
SURGEARREST + W/TEL $55

MULTIMEDIA & CD ROMS

Pro Audio Spectrum Basic $135
Soundblaster 16 Basic $135
DSP Port Sound for Laptops $145
Toshiba 3401 INT $389
Toshiba 3401 EXT $489
NEC Multispin 38 ..... $249
NEC 3xi/3xe Triple Spin ..... $479/$549

DIGITIZERS

Summasketch 12x12 ..... $255
Summasketch 12x18 ..... $499
Summasketch 24x36 ..... $1249

NETWORKING

NETWARE 3.12 5 USER $579
NETWARE 3.12 10 USER $1289
NETWARE 3.12 25 USER $1729
NETWARE 3.12 50 USER $2279
NETWARE 4.0 ..... CALL
NE 2000 ..... $119
LANTASTIC NODERUNNER ST. KIT $429
LANTASTIC NODERUNNER ADT $175
3COM 3C509 ..... $119
3COM 3C509 5 PAK $505
INTEL ETHER 16 ..... $89
INTEL ETHER 16 5 PAK $429
INTEL ETHER 16 20 PAK $1619
SMC ETHER + ELITE COAX $115
SMC ETHER + ELITE COAX 6 PAK $629
XIRCOM POCKET ADAP ADAPTER $259
XIRCOM PCMCIA ETHER ADAPTER $265
ZIRCOM POCKET ETHER PRINT SVR $269

No charge for MasterCard or Visa. We will ship COD on a cash or cashier's check basis only. Shipping & handling 3% – $6 minimum, AK and HI slightly higher. 15% restocking charge on returned items. Purchase orders accepted from Fortune 1000, Government institutions, schools and universities. 2% shipping discount available on orders over $2000 if prepaid by check.

Prices and availability subject to change.

KENOSHA COMPUTER CENTER
2133 91st Street
Kenosha, Wisconsin 53143

KENOSHA COMPUTER CENTER
1-800-255-2989

2 ON READER SERVICE CARD

Mon.-Fri. 8:00 a.m.-7:00 p.m. • Sat. 9:00 a.m.-3:00 p.m.

A New High In Value!
A New Low In Price!

Mail Order Made Easy! By... USA FLEX

FEATURING...

FLEX VL486DX2-66MHZ
System as listed at left upgraded with 8MB RAM

Mitsumi CD/ROM
350ms access, 32K Buffer, 150KB/sec. trans.

NX Pro Stereo Sound Card
Connects directly to CD/ROM, W/ speakers

A selection of up to 6 CD/ROM titles
Complete assortment of information, games, facts. Ask your Sales Representative for available titles

Panasonic 4410 Laser Printer
5ppm, 300 dpi, HP compatible & printer cable

Starting At... $999

FLEX Performer Systems Include

3-1/2 Inch FD
VESA LB Video Board
SVGA Color Monitor, .39mm Interlaced
Microsoft Mouse
MS-DOS 6.2

NOW Including a 24/96 Internal Data/Fax Modem!

Flex 486S 33MHz
Cyrix Cx486S 33MHz
2 MB RAM • 130MB HD
NEW Larger Hard Drive! **$999**

Flex 486D 40MHz
Cyrix Cx486D 40MHz
4 MB RAM • 210MB HD
$1349

Starting At... $1299

FLEX VL486 Systems Include

4 MB RAM
128K Cache • 3-1/2 Inch FD
VESA LB Video Accelerator Board with 1MB video RAM
SVGA Color Monitor, .28mm dot pitch, Non-Interlaced
Microsoft Mouse • MS-DOS 6.2
Windows 3.1

Flex VL486SX-25
Intel™ 486SX 25MHz
4MB RAM • 210MB HD
$1299

Flex VL486DX2-50
Intel™ 486DX2 50MHz
4MB RAM • 340MB HD
$1699

Flex VL486DX-33
Intel™ 486DX 33MHz
4MB RAM • 210MB HD
$1499

Flex VL486DX2-66
Intel™ 486DX 33MHz
4MB RAM • 340MB HD
$1899

All FLEX Systems Come With :

NEW
3 Year Warranty with FLEX Express Parts Replacement

Lifetime Factory Labor Warranty

30 day "No-Risk" Money Back Guarantee

Unlimited Toll-Free Technical Support

On-Site Service Option Available

*3 year limited warranty applies to case, motherboard, CPU, power supply, hard drive, floppy drives, video car, RAM, keyboard, mouse and any other internal component factory installed at the time of purchase. Monitor and other external peripherals covered by standard manufacturers' warranties.

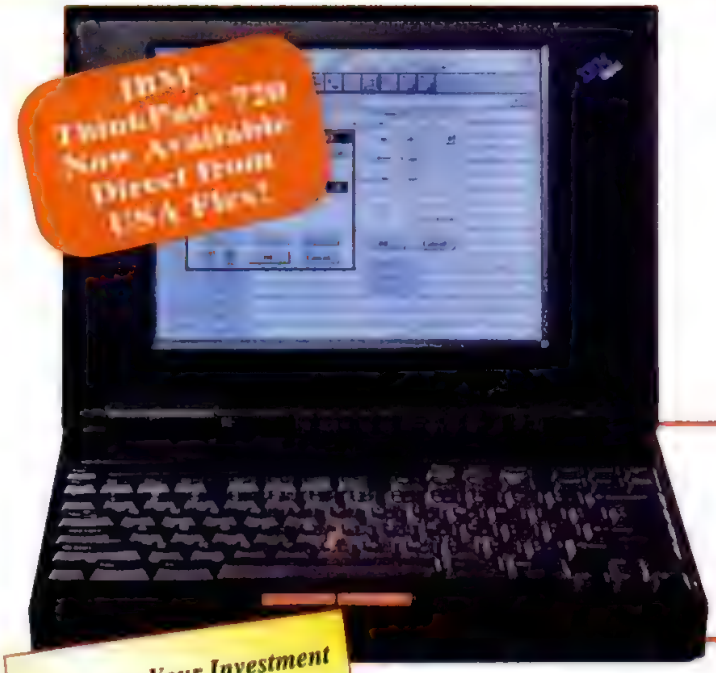
ORDER INFORMATION: Minimum order $80. Minimum shipping and handling per order $11.95. MasterCard, Visa and Discover accepted for USA, Canada, APO, FPO and Puerto Rico. FLEXCARD accepted for continental USA only. A $10 surcharge on credit card orders for APO, FPO and Puerto Rico. C.O.D. order under $500.00, add $5.00, over $500.00, add $10.00 check warranty charge. Call for special UPS Red/Blue C.O.D. rates. APO/FPO, add 5% to cover additional shipping and handling. Call for PAL rates. CORPORATE/GOVERNMENT ORDERS: Corporations rated 1A1 or better and government agencies accepted on Net 30 terms with receipt of a valid purchase order. Leasing Plans available for qualified businesses only. RETURN PRODUCT INFORMATION: All returns must have prior authorization from our Customer Service Department (1-800-955-1488 or 1-708-351-7172 Mon. - Fri. 7:30 a.m. to 6 p.m. & Sat. 9 a.m. to 2 p.m. CT). All returns must be in as-shipped condition, with original packaging, including all warranty cards and manuals. Product Returns may be subject to a restocking charge. We will only accept returns on unopened and non-downloaded software. Software compatibility guaranteed only if we have downloaded it on your new FLEX system. Thirty (30) day money back guarantee applies to FLEX system only (does not include printers or other non-installed peripherals). We will not accept returns on laser printers if toner cartridge has been installed. All prices and specifications subject to change, without notice. Not responsible for typographical or printing errors. All trademarks and registered trademarks are of their respective holders.@1993 USA FLEX.

(708) 582-6206 • FAX (708) 351-7204
Government 1-800-723-2260/Education 1-800-944-5588
Government/Education FAX (708) 351-9871
Habla Espanol 1-800-723-5500 • (708) 924-6780
Pour les Francophones 1-800-723-2256 • (708) 582-6142
Verhandlungen in deutsch (708) 924-6680
(7:00 Uhr bis 15:00 Uhr)(Midnight to 9:00 a.m. CT)
Customer Service 1-800-955-1488
(7:30 a.m. - 6:00 p.m. Mon.-Fri., Sat. 9 a.m. - 2 p.m. CT)

USA FLEX
1-800-333-4515
Open 24 Hours
Monday - Friday
9 A.M. - 4 P.M
Saturday & Sunday

Code # PW

CIRCLE 065 ON READER SERVICE CARD



For Quality Think Now Direct from

IBM® ThinkPad® 720

Starting at...

$2399

Maximize Your Investment
IBM HelpWare®
With 1 Year Onsite Warranty and Toll-Free 24-Hour Technical Support from IBM!

Affordable Desktop Power you can take with you!

IBM ThinkPad 720 Features:

- TrackPoint II pointing device
- 486SLC2 50/25MHz processor
- 16KB internal cache
- 4MB RAM (Exp. 16)
- 3.5" 1.44MB floppy drive
- Removeable hard drive
- Up to 8 hours of battery life
- 9.5" monochrome STN LCD display w/64 shades of gray
- 85 key keyboard
- PCMCIA Type III slot
- 80387SL math coprocessor socket
- NiMH battery pack and AC adapter/charger
- PC-DOS 5 and PRODIGY preinstalled
- 1.9" x 11.7" x 8.3". 6.5 lbs.
- 3 year International Carry-In Warranty

Note: Only monochrome models available.

IBM Business Partner — Authorized Advanced Products Dealer

120MB Hard Drive *9552307* **$2399**

160MB Hard Drive *9552308* **$2549**

Special Rebate Offer! On IBM PS/note™

$1499 Regular Price
-$100 Rebate* from USA Flex
$1399 Your Price!

*Rebate offer good from 12/15/93 thru 1/31/94 while supplies last.

IBM Quality and Reliability

- Light Weight-only 5.2 lbs.
- Small size-8.3" x 11.7" x 1.9"
- Intel 386SL-25MHz
- 85MB Hard Drive
- 2MB memory Expandable to 10MB)
- 2400/9600 Internal Data/Fax Modem
- 3.5" 1.44MB Internal Diskette Drive
- 10" VGA Display with 64 shades of gray

Free Preloaded Software

- IBM PC-DOS 5.0
- MS Windows 3.1
- PRODIGY
- WinFax LITE
- Promenade
- PS/note Index
- PS/note Fitness
- Address Book Plus

IBM ThinkPad 720 Options:

Additional AC adapter (40W) *49G2165*	$99
NiMH Battery Pack *49G2166*	$179
Quick Charger *49G2170*	$199
Car battery adapter *49G2167*	$169
Memory: 2MB/4MB/8MB	CALL
Docking Station *3550002*	$859
Carrying Case *07G1530*	$89
PCMCIA 24/96 Data/Fax Modem *42G2581*	$365
PCMCIA 14.4/14.4 Data/Fax Modem *42G2582*	$545

Mail Order Made Easy! By...

USA FLEX

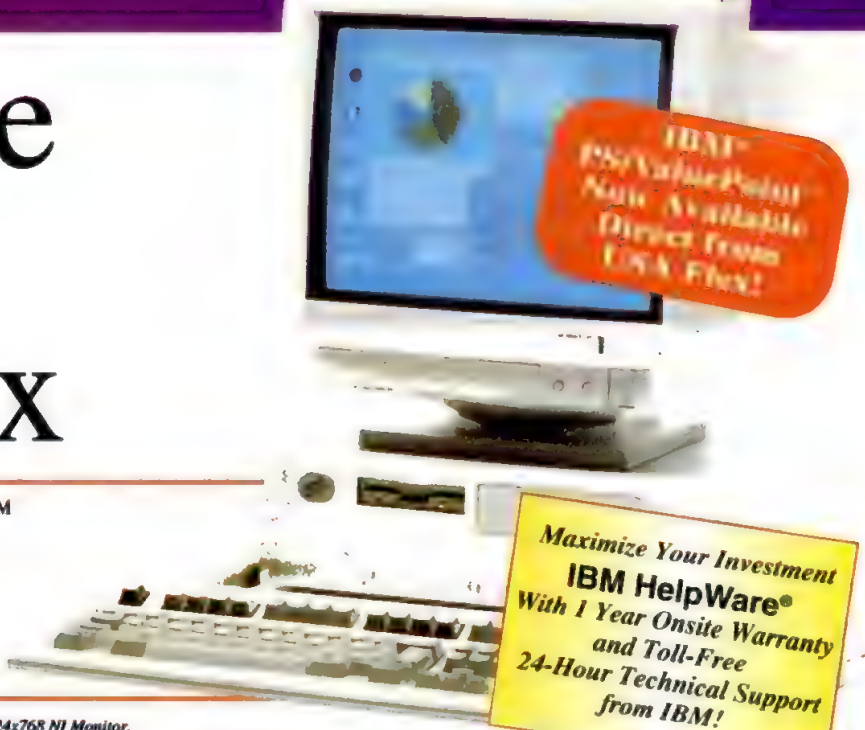
Code # PM01B4 — 471 Brighton Drive, Bloomingdale, IL 60108

TO ORDER, CALL... **1-800-876-5607**

Federal Express® Delivery Service Available

No Surcharge On These Credit Cards

and Value IBM USA Flex



IBM® PS/ValuePoint™

Starting At...

$1249*

** System prices include 14" FLEXVISION SVGA .28mm dot pitch, 1024x768 NI Monitor.*

Power & Performance at an affordable price!

All PS/ValuePoint Systems Feature

- Genuine Intel Microprocessors
- 4MB RAM (Upgradeable to 64 MB)
- VESA Local Bus SVGA video: 640x480, 800x600, 1024x768, 1280x1024
- One 3.5", 1.44MB diskette drive
- 2 serial, 1 parallel, keyboard, mouse
- Basic 101-key keyboard
- IBM DOS and MS Windows 3.1
- 1 Year Onsite Warranty
- Around-the-clock IBM HelpWare Support

intel inside

IBM Business Partner
Authorized Advanced Products Dealer

Choose the ValuePoint system that's right for you!

PS/ValuePoint Si

Featuring IBM quality and 486 performance at an entry level price.

PS/ValuePoint SpaceSaver

Featuring compact size (4.8" x 14.2" x 16.6") a 32-bit VLB slot, a ZIF socket for fast upgrades, and upgradability to Pentium™ via Intel OverDrive™ technology.

PS/ValuePoint Desktop

Featuring all of the power and versatility of the ValuePoint SpaceSaver system above, PLUS room for future expansion with slots and 5 bays inside the 5.8"H x 15.9"W x 16.6"D.

ValuePoint Options

4MB, 8MB, 16MB memory kits, 128K, 256K Cache memory kits, 5.25" half-height int. disk drive, *Specific ptions may vary by model. Ask your sales representative for details.*

IBM PS/ValuePoint Specifications

Model	Clock Speed	Hard Drive/ Ave. Access	ISA Slots	3.5"/5.25" Bays	Video RAM	DOS Version	Flex Part #	Flex Price* without monitor	Flex Price* with monitor
PS/ValuePoint Si - SpaceSaver									
486SX	25 MHz	120 MB/15 ms	3	2/1	512K	6.1	*6381F30*	Call	$1249
486SX	25 MHz	212 MB/13 ms	3	2/1	512K	6.1	*6381F50*	Call	$1349
486DX	33 MHz	120 MB/15 ms	3	2/1	512K	6.1	*6381M30*	Call	$1579
PS/ValuePoint SpaceSaver (Includes 32-Bit VLB Slot, ZIFF socket, and is Pentium™ Overdrive Upgradeable)									
486SX	25 MHz	245 MB/15 ms	3	2/1	1 MB	5.2	*6382F50*	Call	$1559
486DX	33 MHz	245 MB/15 ms	3	2/1	1 MB	5.2	*6382M50*	Call	$1899
PS/ValuePoint Desktop (Includes 32-Bit VLB Slot, ZIFF socket, and is Pentium™ Overdrive Upgradeable)									
486SX	33 MHz	245 MB/15 ms	5	3/2	1 MB	5.2	*6384K50*	Call	$1759
486SX	33 MHz	340 MB/14 ms	5	3/2	1 MB	5.2	*6384K70*	Call	$1899
486DX	33 MHz	120 MB/15 ms	5	3/2	1 MB	5.2	*6384M30*	Call	$1799
486DX	33 MHz	245 MB/14 ms	5	3/2	1 MB	5.2	*6384M52*	Call	$1959
486DX	33 MHz	340 MB/14 ms	5	3/2	1 MB	6.1	*6384N70*	Call	$1999
486DX2	66 MHz	245 MB/15 ms	5	3/2	1 MB	5.2	*6384W50*	Call	$2299

**System prices include 14" FLEXVISION SVGA .28mm dot pitch, 1024x768 NI Monitor.*
Other ValuePoint models (including Mini-Tower) are available.
Ask your Flex Sales Representative for details and prices.

Genuine IBM SVGA Monitors

14" .39mm dot pitch, 1024x768*i* *6318*.. $299
14" .28mm dot pitch, 1280x1024 NI Energy Star Compliant *6324*..... $449*
15" .28mm dot pitch, 1280x1024 NI Energy Star Compliant *6325*..... $599*
**Limited Availability*

IBM HelpWare Service and Support

HelpCenter®
- 24 hours/7 days a week service assistance by telephone, electronic bulletin board, or automated fax.

Onsite Service (In all 50 states!)

HelpBuy™ Programs
- 30-day, Money-Back Guarantee
- Trade-in Program

HelpLearn™ Programs
- IBM Licensed Education Centers

IBM, ThinkPad, HelpCenter and HelpWare are registered trademarks and PS/ValuePoint, TrackPoint II, PSNote, HelpBuy, and HelpLearn are trademarks of International Business Machines Corporation. Pentium, Intel and the Intel Inside logo are registered trademarks of Intel Corporation.

ORDER INFORMATION Minimum order $80 Minimum shipping and handling per order $11 95 MasterCard Visa and Discover accepted for USA, Canada, APO FPO and Puerto Rico FLEXCARD accepted for continental USA only A $10 surcharge on credit card orders for APO, FPO and Puerto Rico C O D. order under $500 00 add $5 00, over $500 00 add $10 00 check warranty charge Call for special UPS Red/Blue C O D rates APO/FPO add 5% to cover additional shipping and handling Call for PAL rates CORPORATE/GOVERNMENT ORDERS Corporations rated 1A1 or better and government agencies accepted on Net 30 terms with receipt of a valid purchase order Leasing Plans available for qualified businesses only RETURN PRODUCT INFORMATION: All returns must have prior authorization from our Customer Service Department (1-800-955-1488 or 1-708-351 7172 Mon - Fri 7:30 a.m. to 6 p.m & Sat. 9 a.m. to 2 p.m. CT) All returns must be in as-shipped condition, with original packaging, including all warranty cards and manuals. Product Returns may be subject to a restocking charge We will only accept returns on unopened and non-downloaded software Software compatibility guaranteed only if we have downloaded it on your new FLEX system Thirty (30) day money back guarantee applies to FLEX system only (does not include printers or other non-installed peripherals). We will not accept returns on laser printers if toner cartridge has been installed. All prices and specifications subject to change, without notice. Not responsible for typographical or printing errors. All trademarks and registered trademarks are of their respective holders. © 1994 USA FLEX

(708) 582-6208 • FAX (708) 351-7204
Gvn't 1-800-723-2280/Ed. 1-800-944-5588
Gvn't/Ed. FAX (708) 351-6671
Hablo Espanol 1-800-723-5600 • (708) 582-6142
Pour les Francophones 1-800-723-2256 • (708) 582-6179
Verhandlungen in deutsch (708) 924-6680
(7:00 Uhr bis 15:00 Uhr)(Midnight to 9:00 a.m. CT)
Customer Service 1-800-955-1488
(7:30 a.m. - 6:00 p.m. Mon.-Fri., Sat. 9 a.m. - 2 p.m. CT)

USA ★ FLE
1-800-876-5
Open 24 ho
Monday - Fr
9 A.M. - 6
Saturday
Code

CIRCLE 210 ON READER SERVICE CARD

USA FLEX ...THE BEST NAMES

PRINTERS

IBM® PRINTERS BY LEXMARK™

LaserPrinter 6	$939
LaserPrinter 10	$1119
LaserPrinter 4039 10R	$1339
LaserPrinter 4039 12R	$1689
LaserPrinter 4039 10D	$1839
LaserPrinter 4039 12L	$2399
LaserPrinter 4039 16L	$2729
LaserPrinter 4037 5E	$659
Ink Jet 4076 ExecJet II	$279
PS4079 Color	$2499
2380 Plus/2381 Plus	$309/$439
2390 Plus/2391 Plus	$329/$439

EPSON LASER PRINTERS — EPSON

ACTION LASER 1000	$589
ACTION LASER 1500	$659
ACTION LASER 1500-II	$719

EPSON DOT MATRIX PRINTERS

LX-810	$169	LQ-870	$439
AP 3250	$174	LQ-1170	$598
AP 3260	$209	LQ-2550 Clr.	$899
LQ-570+	$239	DFX-5000	$1299
FX-870	$268	DFX-8000	$2199
FX-1170	$349	Stylus 300	$234
LQ-1070+	$359	Stylus 800	$279

Panasonic Office Automation

LASER PRINTERS

KX-P4400	$549	KX-P4440	$1144
KX-P4410	$549	KX-P5400	$849
KX-P4430	$639		

DOT MATRIX PRINTERS

KX-P1150	$129	KX-P1624	$375
KX-P2180	$154	KX-P1695	$384
KX-P2023	$189	KX-P2624	$395
KX-P2123	$224	KX-P1654	$589
KX-P2124	$294	KX-P1124I	$209

NEC

PRINTERS

Silentwriter Model 610	$629
Silentwriter 95f/fx	$869/$1099
Silentwriter 97/97fx	$1055/$1269
Silentwriter Model 1097	$1379
NEC Jetmate 1000	$269

TEXAS INSTRUMENTS

microLaser™ Pro 600	$1309*
microWriter Basic	$519
microWriter PS23	$679
microWriter PS65	$939
microMarc™	$249**

*After $50 and user rebate thru 12-31-93.
**After $30 and user rebate thru 12-31-93.

Canon

BUBBLE JET PRINTERS

BJ-10ex Portable	$239
BJ-200* Narrow Carriage	$259
BJ-230* Wide Carriage	$369
BJ-800C Color	$1499
BJ-820C Color	$1629
BJC-600 Color	$589

LASER BEAM PRINTERS

LBP-430	$589

*After $30 rebate thru 12-31-93.

CD-ROM Bundles, Drives, Sound Cards, Video Boards and Speakers

CD-ROM Bundles

Sony Desktop Library		
	Internal *CDU-31A-LL/L*	$459
	External *CDU-7305*	$549
	Starter Kit *CDU-31A-LL/N*	$269
Creative Labs		
	Omni CD™ (Int.) *D1-131009*	$289
	Discovery CD 8 (Int.) *D1-DSCI-8*	$349
	Discovery CD 16 (Int.) *D1-DSCI-16*	$419
	Edutainment™ 16 (Int.) *D1-EDTI-16*	$479
	Digitaledge CD™ (Int.) *D1-DIGI*	$629
Texel	Home Bundle Int./Ext.	$499/$599
	MultiMedia Bundle Int./Ext.	$829/$929
	Business Bundle Int./Ext.	$599/$669

Drives

Mitsumi	*D1-LUOOS* (Int)	$169
Sony Double Speed SCSI		
	Internal *D1-CDU-561-01*	$369
	External *D1-CDU-7811-1*	$519
	Sony Interface Kit Int./Ext.	$99/$109
	Micro Channel Interface Kit	$199
Teac	Internal *D1-CD-50S*	$339
Texel	CD-ROM Int./Ext.	$489/$569
Toshiba	Internal *XM3401B-TA*	$399
	External *3401E100000*	$499
NEC-New 3x MultiSpin Family		
	3Xi Internal *D1-CDR-3XI*	$469
	3Xe External *D1-CDR-3XE*	$559
	3Xp Personal - White *D1-CDR-3XPW* or Gray *D1-CDR-3XPG*	$429
Chinon	Internal *D1-CDS-535*	$359
	External *D1-CDX-535*	$429

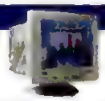
Sound Cards and Video Boards

MediaVision		
	ProAudio Spectrum 16	$165
	ProAudio Studio 16	$215
	Fusion CD 16 (Int.)	$639
	Pro 16 MultiMedia Internal System II	$849
Aztech	Sound Galaxy NX Pro Extra	$99
	Sound Galaxy NX II	$69
	Sound Galaxy Basic 16	$115
	Sound Galaxy Basic 16 Extra	$135
	Sound Galaxy Sony Adapter	$10
Creative Labs		
	Sound Blaster Pro Deluxe	$119
	Sound Blaster 16 Basic	$139
	Sound Blaster 16 SCSI-2™	$179
	Sound Blaster 16 SCSI-2 Advanced Signal Processing	$219
	Sound Blaster 16 MultiCD™	$169
	Sound Blaster 16 MultiCD Advanced Signal Processing	$189
	WaveBlaster™	$179
	Voice Assist™	$59
New Media Graphics		
	Tape It!	$345
	Watch It!	$249
ADS	Video Clipper	$339
	PC Prime Time	$379
	VGA-TV Elite	$269

Speakers

Altec Lansing	
ACS50	$75
ACS150	$115
ACS100	$145
ACS300	$285

MONITORS



NEC

Factory Serviced	
3FGx	$349
4FG	$429
5FG	$1079
Special Purchase	
3D	$359
5FG/6FG (OEM models)	$1099/$1999

14" SVGA	$409
15"3V	$509
15" 3FGe	$579
17" 5FGe	$1049
17" 5FGp	$1359
21" 6FGp	$2369

SAMSUNG ELECTRONICS

14" CVL4955	$229
14" SyncMaster 2	$239
14" SyncMaster 3/3n	$269/$299
15" SyncMaster 15C	$449
17" SyncMaster 4 Plus	$619
17" SyncMaster 5C	$899

FLEXVISION

14" VGA MONO	$119
14" 1024X768 NI	$265
15" 1280X1024	$429

CTX

14" 5439-A	$219
14" 5468	$249
14" 1451 NI	$269
14" CPS 1461LR	$299
15" CPS 1561/1560LR	$369/$379
17" CPS 1760	$719

MAG

14" LX1450 LG	$319
15" MX15F	$519
17" MX17F	$949

HITACHI SuperScan™

15" 15S	$489
17" Elite 17	$1349
20" 20S	$1389
20" Pro20	$1689
21" Pro21/Elite21	$2199/$2499

SONY

14" CPD-1320	$329
17" CPD-1604S	$949
20" GDM-2036S	$2069

DATA CARTRIDGES

3M — *Buy 5 get the 6th cartridge FREE!**

DC2000 40/80MB	$11.95 ea.
DC2120 120/250MB	$15.95 ea.
DC2120 Ximat (QIC-80)	$20.95 ea.
DC2120 Rhomat	$25.45 ea.
DC600A	$16.95 ea.
DC6150 250/500MB	$17.95 ea.
DC6250 250/500MB	$22.95 ea.
DC6525 350/700MB	$27.95 ea.

*1 FREE cartridge per customer thru January.

TAPE BACK-UP

COLORADO MEMORY SYSTEMS INC.

Ask about special on tape caddy.

JUMBO 250 Int/Ext.	$179/$269
JUMBO TRAKKER 120MB	$289
JUMBO TRAKKER 250MB	$349
POWERTAPE™	
2GB Int/Ext.	$949/$1089
4GB Int/Ext.	$1489/$1589

VIDEO CARDS

DIAMOND

SPEEDSTAR PRO 1MB ISA/VLB	$109/$119
STEALTH PRO VLB 2MB	$339
VIPER VLB 2MB	$399

ATI

GRAPHICS ULTRA+ 2MB	$239
GRAPHICS ULTRATM PRO 2MB ISA/VLB/EISA	$359/$359/$399

ORCHID

Fahrenheit 1280+ 1MB ISA/VLB	$159/$169
Fahrenheit VA 1MB ISA (only)	$179
Celsius VLB 1MB/2MB	$239/$299

H-P FAX MACHINES

HEWLETT PACKARD

HP FAX-900 Plain paper fax	$769
HP FAX-310 Plain paper fax	$1179

MODEMS

Hayes

	Int./Ext.
ACCURA 2400	$65/$75
ACCURA 96+fax96	$189/$209
ACCURA 144+fax144	$199/$229
Optima 144+ fax Pocket Ed.	$119

USRobotics

	Int./Ext.
Sportster 9600 FAX	$159/$169
Sportster 14.4 FAX	$179/$199

FLEX *ultimate*
14,400/14,400 V.32 MODEM
Communication S/W and FaxWorks Fax S/W both for DOS and Windows.
Int. $149 Ext. $169

Mail Order Made Easy! By...

USA FLEX

Code # PM01B4 — 471 Brighton Drive, Bloomingdale, IL 60108

TO ORDER, CALL... **1-800-766-1940**

Federal Express® Delivery Service Available

No Surcharge On These Credit Cards

FOR LESS!

SPECIAL

TOSHIBA Color Notebook

T1850C
386SX-25 Color
80MB Hard Drive, 4MB (Max: 12MB), passive color VGA 9.5" screen, Trackball, NiCd Battery, DOS 5.0, Windows 3.1.
Limited availability.

For Only **$1499**

TOSHIBA *PC1033U--0A*

COMPAQ

SPECIAL PURCHASE
Factory-Reconditioned CONTURAs with 1 Year Factory Carry-In Warranty.

CONTURA 386SL/20
84 /w+ $1099
CONTURA 386SL/25
120 /w+ $1299
CONTURA 4/25
120 /w+ $1699
CONTURA 4/25C
120 /w+f/m $2399
Other Models Available.
Limited Availability.

151 FS Clr Monitor $409
(Low Emissions) $539

Contura 4/25			
120/240*/w	$1879	209/418*/w	$2149
Contura 4/25c			
120/240*/w	$2599	209/418*/w	$2879
LTE Lite 4/25			
120/240*/w	$2039	209/418*/w	$2319
LTE Lite 4/25E			
120/240*/w	$2759	209/418*/w	$3049
LTE Lite 4/33C			
120/240*/w	CALL	209/418*/w	CALL
PROLINEA 4/25s			
120/240*/w+	$989	240/480*/w+	$1089
PROLINEA 4/33s			
120 /w	$1079	240 /w	$1219
340 /w	$1299		
PROLINEA 4/50			
120/240*/w	$1479	120/240*/w+	$1569
240/480*/w	$1629	240/480*/w+	$1699
340/680*/w	$1699	340/680*/w+	$1799
PROLINEA 4/66			
120/480* /w	$1679	240/480* /w	$1869
240/480* /w+	$1829	340/680* /w	$1929
340/680* /w+	$1929		
DESKPRO 4/25is			
240/480*/n	$1699	240/480*/n	$1749
DESKPRO 4/33is		340/680*/w	$1999
DESKPRO 4/33i		240/480*/w	$2029
DESKPRO 4/66i	240/480*/n		$2399
DESKPRO 486/33M (w/o HD)	$1879	340	$2789
DESKPRO 50M			
120MB	$2499	340MB	$3169

*Capacity of HD with/with-out DOS Double Space. Models /n = Includes Ethernet 16TP Controller

TEXAS INSTRUMENTS

TravelMate 4000E WinSX/25 Mono. $1849
TravelMate 4000 WinDX/25 Mono. 120/200MB $1999/$2179
TravelMate 4000 WinDX2/50 Mono. 120MB $2529
TravelMate 4000E WinDX2/50 Mono. 200MB $2699
TravelMate 4000E WinSX/25-Advanced Passive Color $2099
TravelMate 4000 WinDX2/40 Color $2959
TravelMate 4000E WinDX2/50-Dual Scan Color $3219
TravelMate 4000E WinDX2/50-Active Matrix Color $3799

AST COMPUTER

The Product Of Our Obsession

BRAVO Notebooks
i486SX-25, 8K cache, 4MB RAM, PCMCIA Slot, 1.44MB, 3.5" FDD, DOS 6.0, Windows
Mono 80/120/.. $1659/$1769
170MB $1869
Color 120MB $2229
170MB $2529
ColorPlus 170MB $3299

NEC

NEC VERSA 486SL
i486SL™, 8K Cache, 4MB RAM (exp. to 12MB), 256K Flash ROM, PCMCIA Slot, removable 1.44MB 3.5" FD, LB video, 83 key keyboard. 11.7"W x 9.4"D 2.10"H. DOS 6.0. Win.

VERSA i486 Mono
9.4" STN LCD. 640x480, 64 shades of gray, 6.10 lbs.
25MHz 120MB $2639
33MHz 180MB $3179
33MHz 250MB $3389

VERSA i486 Color
9.5" active-matrix TFT LCD. 640x480, 256 colors (SVGA), 6.8 lbs.
25MHz 120MB $3689
33MHz 180MB $4239
33MHz 250MB $4569

HEWLETT PACKARD

Authorized Dealer

Introducing HP DeskJet 310 & HP DeskWriter 310 Printers!

HP DeskJet 310 Printer (PC)
C2621A $299
HP DeskJet 310 Printer w/ 60-sheet cut sheet feeder *C2622A* $359
HP DeskWriter 310 Printer (MAC)
C2617A $299
HP DeskWriter 310 inkjet Printer w/ cut sheet feeder
C2623A $359

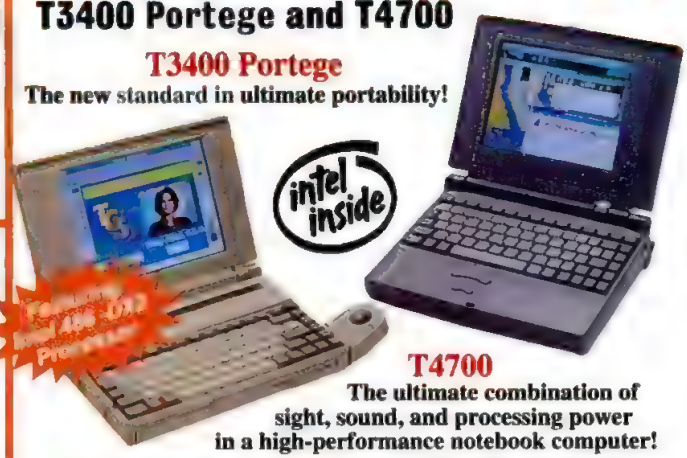
COLOR Capable Kit Available!

Shown with optional 60 sheet cut sheet feeder

TOSHIBA

NEW

Introducing 2 New Models-
T3400 Portege and T4700



T3400 Portege

The new standard in ultimate portability!

T4700

The ultimate combination of sight, sound, and processing power in a high-performance notebook computer!

These Toshiba Notebooks come with a 3.5" 1.44MB Diskette Drive, at least one PCMCIA Slot, MS-DOS 6.0 and Windows 3.1

T1900/T1900C 9.5" screen, i486SXA 20MHz, 4MB (max: 20 MB), 8K Cache, NiMH bat, 1 PCMCIA-2 slot (14.5mm Type III), UltraFont. **1 year warranty.**

T1900 Mono. LCD Screen, 11.7"x2"x8.4", 6.4lbs.
120MB/200MB *PA1111U-M2A/PA1112U-M2A* $1499/$1699
T1900C Color-Passive, 11.7"x2.1"x8.4", 6.95lbs.
120MB/200MB *PA1111U-X2A /PA1112U-X2A* $2089/$2319

T1950/T1950CT/T1950CS
Same features as T1900 series, with i486DX2 40MHz
T1950 9.5" Mono. LCD Screen, 11.7"x2"x8.4", 6.5 lbs.
120MB/200MB *PA1151U-M2A/PA1152U-M2A* $1879/$2089
T1950CS 9.5" Color-Passive, 11.7"x2.1"x8.4", 6.95 lbs.
120MB/200MB *PA1151U-S2A/PA1152U-S2A* $2479/$2699
T1950CT 8.4" Color-Active, 11.7"x2.1"x8.4", 6.95 lbs.
120MB/200 MB *PA1151U-T2A /PA1152U-T2A* $2849/$3129
320MB *PA1153U-T2A* $3489

T3400/T3400CT PORTEGE 8.4" screen, i486SX 33MHz, 3.3v, 4MB (max: 20 MB), 8K cache, 120MB HD, Built-in AccuPoint, External Diskette Drive, Type II PCMCIA-2 slot, COMMWORKS for Win. **3 year warranty.**

T3400 Mono. LCD Screen, 64 gray scale at 320x200, 16 gray scale at 640x480, 9.9"x7.9"x1.7", 4.1lbs. *PA1116U-M9A* $2229
T3400CT Color Active-Matrix, 256 Colors (from a palette of 262,144) at 640x480, 9.9"x7.9"x1.8", 4.4lbs. *PA1116U-T9A* $3449

T4600/T4600C 9.5" screen, i486SL 33MHz, 4MB (max: 20 MB), 8K cache, 2 PCMCIA-2 slots: (1-Type II, 1-16mm Type "IV"), UltraFont, 1.7"x8.3"x1.8". **3 year warranty.**

T4600 Mono. LCD Screen, NiCad battery, 6.4lbs.
120MB/200MB *PA1201U-M2A/PA1202U-M2A* $2299/ $2499
T4600C Color Active-Matrix, NiMH battery, 6.7lbs.
120MB/200MB *PA1201U-X2A/PA1202U-X2A* $3899/$4149
340MB *PA1203U-X2A* $4449

T4700CS/T4700CT 9.5" screen, i486DX2 50MHz, 3.3v, 8MB (max: 24 MB), 8K cache, 200MB HD, 2 PCMCIA-2 slots: (1-Type II, 1-16mm Type "IV"), MS Sound System, Indeo™ 3.0 & UltraFont, 6.9lbs. **3 year warranty.**

T4700CS Color Dynamic-Passive LCD , 256 SVGA colors at 640x480, 11.7"x8.3"x2.0".
200MB/320MB *PA1156U-S2A/PA1157U-S2A* $3899/$4239
T4700CT Color Active-Matrix Screen, 256 colors (from a palette of 262,144) at 640x480, 11.7"x8.3"x2.2".
200MB/320MB *PA1158U-T2A/PA1159U-T2A* $4579/$4929

T6600C, T6600C/CD, T6600C/CDV Color-Active 10.4" screen, i486DX2 66MHz, 8K cache, 8MB (max: 40 MB), 510 Hard Drive, 2 full-length 16-bit ISA slots. 16mm PCMCIA 2.01 compliant slot (supports Type I, II, and III cards), 5.25" half-height drive bay, UltraFont™, 15.4"x12.6"x4.7", AC power only. **3 year warranty.**

T6600C 17.1lbs. *PA1609U-X7A* $6289
T6600C/CD Includes Internal CD-ROM drive (330KB/sec, 230ms access), 18.7lbs. *PA1609U-X8A* $6799
T6600C/CDV Includes Internal CD-ROM drive (330KB/sec, 230ms access), MediaShare®, Mambo™, and DVI®/Ethernet™ board. 19.3lbs.
PA1609U-X5A $7849

ORDER INFORMATION: Minimum order $50. Minimum shipping and handling charge is $10. Master Card, Visa and Discover accepted for USA, Canada APO, FPO and Puerto Rico. C.O.D. order under $500.00 add $4.00, over $500.00 add $10.00 check warranty charge (all for special PC Red Book C.O.D. add $10.00) and/or other additional shipping and handling charges. CORPORATE GOVERNMENT ORDERS: Corporation, related IAT, or better and government agencies accepted on Net 30 terms with receipt of valid purchase order. Leasing: Please inquire. • Qualified business only. OEM PRODUCT INFORMATION: All returns must have prior authorization. Minimum Customer Service Department 1-800-955-1488 (Mon. - Fri. 10:00 a.m. - 6:00 p.m. Sat. 9 a.m. - 2 p.m. CT). All shipments have been shipped in factory with original packaging including all warranty cards and manuals. Product Returns may be subject to a restocking charge. We will only accept returns on unopened and non-downloaded software. Software non-defectively guaranteed only if we have downloaded it onto our new FLEX system. Thirty (30) day money back guarantee applies to FLEX system only does not include printers or other non-installed peripherals. We will not accept returns on laser printers if their cartridge has been installed. All prices and specifications subject to change without notice. Not responsible for typographical or printing errors. All trademarks and registered trademarks are of their respective holders. ©1994 USA FLEX

(708) 582-6206 • FAX (708) 351-7204
Gvn't 1-800-723-2260/Ed 1-800-944-5588
Gvn't/Ed. FAX (708) 351-9871
Habla Espanol 1-800-723-5500 • (708) 582-6142
Pour les Francophones 1-800-723-2256 • (708) 582-6179
Verhandlungen in deutsch (708) 924-6680
(7:00 Uhr bis 15:00 Uhr)(Midnight to 9:00 a.m. CT)
Customer Service 1-800-955-1488
(7:30 a.m. - 6:00 p.m. Mon.-Fri., Sat. 9 a.m. - 2 p.m. CT)

USA FLEX
1-800-333-4515
Open 24 Hours
Monday - Friday
9 A.M. - 4 P.M.
Saturday & Sunday
Code # PM01B4

CIRCLE 055 ON READER SERVICE CARD

MEMORY!

H.Co. has America's largest selection of memory products, and we'll beat any USA advertised price!

PCMCIA PRODUCTS

BRAND NEW DEALS!

SRAM

1MB SRAM Card	$135.00
2MB SRAM Card	265.00
512K for Apple Newton	125.00
1MB for Apple Newton	165.00
2MB for Apple Newton	265.00

FLASH

2MB Flash Card	$265.00
4MB Flash Card	485.00

HARD DRIVES

85MB Type III	$515.00
105MB Type III	565.00
85MB Type III+	495.00
130MB Type III+	675.00

FAX MODEMS

9600/4800	$155.00
14.4/14.4	265.00
14.4/28.8	335.00
28.8/28.8	CALL

PERIPHERALS

10-Base T Network Adaptor	$179.00
Internal Desktop PCMCIA Card Reader	285.00

Math Coprocessors And CPU Upgrades

INTEL Overdrive

486-33 (66 Mhz)	$545.00
486-25 (50 Mhz)	415.00
486-16/20 (40 Mhz)	315.00

CYRIX Overdrive

386-25 to 486-25	$95.00
386-33 to 486-33	115.00
386-40 to 486-40	145.00
386sx20 to 486-40	275.00
386-16 to 486-32	285.00
386-20 to 486-40	335.00
386-25 to 486-50	375.00

INTEL

80387DX	$89.00
80387SX	87.00
80486SX	87.00
80287XL/XLT	72.00

IIT

80387-40	$82.00
80387-33/25	69.00
80387SX-33	75.00
80387SX-25/20	64.00

Cyrix

Kingston processor upgrades also available

Laser Printer Memory

HP Laserjet II, IID, IIP, III, IIID	2MB BD	$99.00
	4MB BD	175.00
HP Laserjet 4L	1MB MD	68.00
HP Laserjet 4, 4M, 4P, IIIsi	2MB MD	95.00
	4MB MD	162.00
	8MB MD	299.00
HP Deskjet 500, 500C, 550C	256K MD	59.00
IBM 4019, 4019e	2MB MD	119.00
	3.5MB MD	189.00
IBM 4029, 4039, 4079	2MB BD	89.00
	4MB BD	169.00
OKI Laser 400	2MB MD	99.00
OKI Laser 800, 820	2MB MD	129.00
	4MB MD	199.00
Panasonic 4420, 4450i, 4410, 4430	2MB MD	119.00
	4MB MD	189.00
Panasonic 4455	2MB MD	159.00
Epson EPL6000	4MB MD	189.00
Epson EPL 7500	2MB MD	145.00
	4MB MD	225.00
Epson Action Laser II	2MB MD	149.00
	4MB MD	229.00
Canon LBP-III, IIIPlus	2MB BD	239.00
	3MB BD	195.00
Canon LBP-4	2MB BD	145.00
Canon LBP 4SX	4MB MD	219.00
TI MicroLaser, XL	1MB MD	49.00
	4MB MD	229.00

German Office: H.Co. Computer Products, Inc.
Deisterstrasse 11 • 30449 Hannover, Germany
Tel: 0511-458-2411 Fax: 0511-458-2440

Desktop Memory Upgrades

AST

Bravo 486/25	2MB KIT	$110.00
	8MB KIT	287.00
Bravo 4/66d 50d 33 33s 25s	4MB MD	145.00
	8MB KIT	289.00
	16MB MD	619.00
Prem 386/SX 16, 20, 25, 33	8MB KIT	289.00
Prem II SX/33 25 20 16	1MB KIT	55.00
	4MB KIT	149.00
	0MB BD	219.00
Cupid Exp		
Prem 386c Wkst&Bravo 286	4MB KIT	179.00

NEC

PM SX SX PLUS	2MB BD	$219.00
	4MB BD	279.00
	8MB BD	519.00
PM SX/20	2MB CPU UPG	169.00
	2MB UPG EXP	209.00
	2MB UPG KIT	89.00
PM SX/16	2.8MB BD	189.00
	2MB UPG KIT	85.00
PM 386/20-25	2MB MD	299.00
	8MB MD	699.00
PM 386/25	8MB REP BD	999.00
PM 386/25S	2MB KIT	159.00
	8MB KIT	499.00
PM 386/33E 486-25E	2MB MD	199.00

COMPAQ

DP 386/33 486/25 33 System Pro	2MB MD	[illegible]
	8MB MD	289.00
DP 386/20e 20,25e 25 386s 16	4MB BD	269.00
	4MB MD	169.00
DP 386N 386SX/20,ProSignia	2MB MD	79.00
	4MB MD	159.00
ProSignia	8MB MD	309.00
ProLinea 4/25s,33,50	8MB MD	309.00

IBM

50Z 55SX LS 65SX,LS 70 E61 70 121 P 70	1MB MD	$50.00
	2MB MD	80.00
55SX,LS 65SX,LS	4MB MD	149.00
70-A21 70-A61 70-B21 70-B61	2MB MD	80.00
30/286	2MB KIT	80.00
PS/1 286 386SX	2MB UPG	90.00
80-121	1MB BD	79.00
80-111,31	2MB BD	99.00
80-A21,A31,A61	4MB BD	149.00
57 57SX,90 95 PS/1 Pro	4MB MD	149.00
	8MB MD	289.00
[illegible]	4 14MB BD	279.00
50 & 60 SERIES	4 14MB BD	259.00

SIMM MODULES

1X9-80	$48.00	2X8-80	$88.00
1X9-70	49.00	4X8-70	149.00
1X9-60	54.00	16X8-70	565.00
1X9(3)-70	45.00	512X36-80	90.00
4X9-70	154.00	1X36-80	169.00
1X8-80	47.00	2X36-70	359.00
1X8-70	48.00	4X36-70	649.00

H.Co. Computer Products is licensed to manufacture modules from the inventor of standard PC technology simms!

H.Co Supports Fully Compatible Memory For These Leading Systems:
ALR • Apple • AST • AT&T • Canon • Compaq • Data General • DEC • Dell • Epson • Everex • HP • IBM • ICR • NEC • Olivetti • Packard Bell • Panasonic • Sun • Silicon Graphics • TI • Toshiba • Zenith and more...

H.Co. is now open weekends!

Laptop Memory

TOSHIBA

T2000SX SXE,T1800 T1850	4MB	$169.00
	8MB	319.00
T3100SX,T3200SX/SXC	2MB	89.00
	4MB	149.00
T3200	3MB	149.00
T5100	2MB	[illegible]
T5200,C,T8500	2MB	89.00
	8MB	[illegible]
T3100	2MB	189.00
T4400,T6400,T3300	2MB	139.00
	4MB	[illegible]
T4400 T6400	8MB	[illegible]
T4500	4MB	[illegible]
	8MB	419.00
	16MB	[illegible]
T1900 T4600	[illegible]	259.00
	8MB	475.00
	16MB	1099.00

IBM

L40SX N51	[illegible]	149.00
	8MB	295.00
CL57SX, Thinkpad	[illegible]	[illegible]
	8MB	659.00
PS Note	[illegible]	CALL
IBM RECOMMENDED	[illegible]	CALL
	[illegible]	CALL
PS Note 486	4MB	CALL
	8MB	CALL
	16MB	CALL

COMPAQ

Contura 3/20,25	4MB	197.00
	8MB	419.00
Contura 425	4MB	199.00
	8MB	429.00
LTE Lite/20 25 25c	4MB	279.00
	8MB	[illegible]
LTE Lite 4/25c	4MB	249.00
	8MB	399.00

NEC

UltraLite III SL/25c	2MB	$149.00
	4MB	249.00
UltraLite SL/20 SL/20P	[illegible]	[illegible]
	6MB	297.00
Prospeed 386	2MB	147.00
	8MB	[illegible]

CANON

NoteJet 486	2MB	$159.00
CANON RECOMMENDED	4MB	259.00
	8MB	459.00

ZENITH

Z Note	2MB	$169.00
	8MB	[illegible]
Z-Sport	2MB	[illegible]
MastersPort SL SLC SLE	2MB	[illegible]
MastersPort 386SX	2MB	119.00
SlimsPort	2MB	139.00
	4MB	279.00

OTHERS

TI TravelMate 2000	1MB	[illegible]
TI TravelMate 3000	2MB	95.00
TI TravelMate 4000	[illegible]	219.00
AST PremExec	[illegible]	135.00
AST PowerExec SL,EL	4MB	179.00
Apple Powerbook (All)	Call for current prices	

All H.Co. Manufactured Memory Products Carry A Lifetime Warranty!

Call H.Co.'s Memory Experts Toll Free

1-800-RAM-CHPS or 1-800-726-2477

Place your order by 4pm (PST) and we'll ship it today

H.Co. Computer Products, Inc.
17922 Skypark Circle Suite F
Irvine, CA 92714
Offfice: 714-833-3222
Tech Support: 714-833-3364
FAX: 714-833-3389

PO's Accepted From Universities, Government Agencies, and Qualified Firms.

TERMS:

1. VISA MC AMEX Discover C.O.D. Pre-paid and Approved PO's only
2. FAX orders, and International orders accepted
3. 15% Restocking fee on returns within 30 days. No refunds after 30 days
4. All returns require an RMA number, sorry no software returns
5. All credit card purchases are verified for your protection

H.Co. will beat a market price from competitors with new merchandise in stock in stock. Offer excludes Chips and SIMMS. Minimum order $25. [illegible] Competitor's advertised price. Memory pricing may be higher than advertised. H.Co. same day shipping guarantee [illegible]

Best Brands From AST to Zenith Data Systems

Super direct buying offers the brand name choices of a superstore with the value and convenience of direct marketing. You receive custom configured "plug and play" systems, overnight delivery, lifetime technical support, and flexible payment plans.

Lowest Price

You always get the lowest available price on PCs Compleat systems. We guarantee it for 30 days after your purchase.

Money Back Guarantee

We guarantee 100% satisfaction with a prompt replacement or refund. It's your choice within 30 days of purchase.

Overnight Delivery

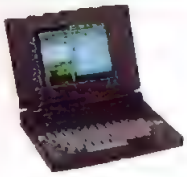
Order any of our 100 standard configurations with overnight delivery by 6 P.M. E.T. weekdays and receive your system tomorrow.

Lifetime Toll-Free Support

Free technical support is available as long as you own your PCs Compleat system.

Custom Configuration

Eliminate installation hassles by letting PCs Compleat install extra memory, a modem, tape or disk drive, or software. Configuration is FREE!



AST Authorized Systems Reseller

Bravo Notebook

- 486SX/25 processor
- Accelerated local bus graphics
- PCMCIA Type III slot
- MS-DOS 6.0, Windows 3.1

Screen	Model	Hard drive	Price
Monochrome	83W	80MB	$1599*
Monochrome	123W	120MB	$1799
Monochrome	123W	170MB	$1899
Dual scan color	123W	120MB	$2449
Dual scan color	173W	170MB	$2559
Active matrix	173W	170MB	$3349

Lease for $58.68/mo.

$1599*

ZENITH DATA SYSTE

A Bull Company

Z-STAR 433VL Notebook

- 486SLC/33 processor
- 4MB RAM expandable to 12MB
- 9.5" screen
- PCMCIA Type II slot
- MS-DOS 6.0, Windows 3.1, MS-Works

Screen	Hard drive	Price
Monochrome	170MB	$1629*
Dual Scan Color	200MB	$2299

Lease for $59.78 /mo.

$1629*

COMPAQ

Contura

- 486SL/25 processor
- 4MB RAM
- Trackball, MS-DOS, Windows
- 3-year warranty

Display	Hard drive	Price
Monochrome	209MB	$2199*
Dual scan color	209MB	$2879

Lease for $80.70/mo.

$2199*

TOSHIBA

Portégé T3400

- 486SX/33 processor
- 4MB RAM expandable to 20MB
- 120MB hard drive
- Ultra-portable at only 4.1 lbs. (4.4 lbs. for color) and 9.9"x7.9"x1.7"
- Integrated AccuPoint™ pointing device

Screen	Price
Monochrome	$2259*
Active color	$3469

Lease for $82.90/mo.

$2259*

NEC

UltraLite Versa E

- 486 processor
- 4MB RAM expandable to 20MB
- 2PCMCIA slots & Local bus graphics
- MS-DOS 6.0, Windows 3.1, Built-in trackball

Processor	Screen	Hard drive	Price
DX2/40	Active color	120MB	$3819
DX2/40	Active Color	250MB	$4229
DX2/50	Monochrome	209MB	$3259*
DX2/50	Monochrome	340MB	$3669
DX2/50	Active color	209MB	$4499
DX2/50	Active color	340MB	$4919

Lease for $119.60/mo.

$3259*

TOSHIBA

T4700

- 486DX2/50 processor
- 8MB RAM expandable to 24MB
- 2 PCMCIA slots, local bus graphics
- Microsoft Sound System, microphone, audio out port
- BallPoint mouse, MS-DOS 6.0, Windows 3.1

Screen	Hard drive	Price
Dual scan color	200MB	$3999*
Dual scan color	320MB	$4329
Active color	200MB	$4599
Active color	320MB	$4949

Lease for $146.76/mo.

$3999*

PCs COMPLEAT

THE BEST: BRANDS · PRICE · DELIVERY · SERVICE

Sales Hours:

Monday-Friday 9 A.M. E.T. - Midnight
Weekends & Holidays 10 A.M.- 8 P.M.

TOLL-FREE SALES

1-800-775-4727

CIRCLE 238 ON READER SERVICE CARD

Texas Instruments

TI TravelMate notebooks were the clear winners in *PC Magazine's* August 1993 comparison of 68 notebook PCs, and accomplished what no other computer manufacturer in any category has ever done — winning five Editor's Choice Awards in a single issue of *PC Magazine.*

What does this mean to you? Simply this: If you're a notebook buyer, you owe it to yourself to seriously consider TI's TravelMate. TI makes the industry's widest range of 486 notebooks optimized for Windows with processors ranging from 25MHz to 50MHz and including monochrome and color models. Whatever your needs, there's a TravelMate that's right for you.

TravelMate 4000E WinDX2 50MHZ Color Notebook

The ultimate blend of 486DX2 power, portability and color!

- ▲ Brilliant color displays - Active matrix color or Dual Scan color
- ▲ Enhanced high-speed video system
- ▲ NEW! 4mm full-travel keyboard with true desktop feel
- ▲ Docking system ready for desktop replacement
- ▲ Pre-installed DOS 6 and optimized Windows 3.1

Lease for $120.70*

Dazzling Speed, Blazing Speed

Active matrix color $3799
Dual scan color $3249*

TravelMate 4000E WinSX25 Color Notebook

If you're looking for unsurpassed value in a powerful, affordable color notebook, TI's TravelMate 4000E WinSX/25 delivers.

- ▲ Advanced color display
- ▲ High-speed video system for Windows performance
- ▲ 4mm full-travel keyboard with true desktop feel
- ▲ 4MB RAM expandable to 20MB
- ▲ Pre-installed DOS 6 and optimized Windows 3.1

Lease for $77.03*

120MB model $2099

TravelMate 4000E WinDX2/50 & WinSX/25

Maximum performance at affordable cost.

- ▲ Enhanced high-speed video
- ▲ NEW! 4mm full-travel keyboard with true desktop feel
- ▲ Pre-installed DOS 6 and optimized Windows 3.1
- ▲ Docking system ready for desktop replacement

Lease for $68.59*

Performance to Match Your Needs

WinDX2/50 $2699
WinSX25 $1869*

TEXAS INSTRUMENTS

PCs COMPLEAT
THE BEST: BRANDS · PRICE · DELIVERY · SERVICE

Sales Hours:
Monday-Friday 9 A.M. E.T. - Midnight
Weekends & Holidays 10 A.M. - 8 P.M.

TOLL-FREE SALES
1-800-775-4727

PC MAGAZINE EDITORS' CHOICE
August 1993
5 models

PC Magazine Award Winner

"The Texas Instruments TravelMate 4000 WinDX2/50 continues to be the top gun of the portable world, outperforming several DX2/66-based Systems"
—PC Magazine

© PCs Compleat. All prices subject to change and do not include shipping. Monitors sold separately. Lease prices reflect 36 month operating lease to approved business customers. All products or brand names are trademarks of their respective companies. PCs Compleat, 34 St. Martin Drive, Marlborough, MA 01752. Phone (508) 480-8500. Not responsible for typographical errors.

AST, Compaq, NEC, Leading Edge, Toshiba

LEADING EDGE

WinPro 486e VL

- 486 processor
- 4MB RAM expandable to 32MB
- VESA local bus graphics
- 3.5" and 5.25" floppy drives
- MS-DOS 6.0, Windows 3.1, Works

Processor	Hard drive	Price
486SX/25	170MB	$969*
486SX/33	170MB	$1059
486DX/33	260MB	$1259
486DX2/66	345MB	$1789

Color VGA monitors start at $229.99

Lease for $50/mo.

$969*

AST Authorized Systems Reseller

Bravo Desktops

- 4MB RAM expandable to 64MB
- 120MB or 210MB hard drive
- Local bus graphics 1024x768
- OverDrive and P24T upgradable

Model	123/W	213/W	Price
4/25s	120MB	—	$999*
4/33	120MB	—	$1299
4/33	—	210MB	$1539
4/66d	—	210MB	$2099

AST SVGA color monitor $379.99

Lease for $50/mo.

$999*

COMPAQ

ProLinea Desktops

- 4MB RAM expandable to 32MB
- 3.5" floppy drive
- Local bus graphics
- MS-DOS 6.0, Windows 3.1, Mouse

Model	Hard drive	Price
486SX/33	120MB	$1109*
486SX/33	240MB	$1259
486DX/33	120MB	$1389
486DX/33	240MB	$1469
486DX2/66	340MB	$1619

Compaq SVGA color monitor $349.99

Lease for $50/mo.

$1109*

AST Authorized Systems Reseller

Bravo LP

- "Green" PC
- 486 processor
- Accelerated local bus graphics
- Local Motion video capability
- Pentium/Overdrive upgradable
- MS-DOS 6.0, Windows 3.1, mouse

Model	RAM	Hard drive	Price
4/25s	4MB	170MB	$1179*
4/33	4MB	170MB	$1449
4/33	8MB	340MB	$1899
4/66d	8MB	210MB	$2449

AST SVGA color monitor $379.99

Lease for $50/mo.

$1179*

NEC

Ready Multimedia Desktops

- 4MB RAM expandable to 36MB
- Internal 2X or3x speed CD-ROM drive
- 16-bit sound card, Labtec speakers, headphones & microphone
- MS-DOS 6.0, Windows 3.1, AOL, CompuServe,Window Works, Compton's Encyclopedia, Dinosaur/Space Adventure
- 9600/4800fax, 2400 data modem

Processor	Hard drive	Price
486SX/25	170MB	$1499*
486SX/33	250MB	$1899

NEC SVGA color monitor $319.99

Lease for $55.01/mo.

$1499*

AST Authorized Systems Reseller

Bravo MT MiniTower

- 4/8MB RAM expandable to 64MB
- 170MB or 340MB hard drive
- EPA Energy Star certified
- 32-bit accelerated local bus
- MS-DOS 6.0, Windows 3.1

Model	RAM	Hard drive	Price
4/33 173W	4MB	170MB	$1539*
4/33 343W	8MB	340MB	$1999
4/66d 173W	4MB	170MB	$2099
4/66d 343W	8MB	340MB	$2539

AST SVGA color monitor $379.99

Lease for $56.48/mo.

$1539*

NO HIDDEN CHARGES

No Hidden Charges

We don't add credit card surcharges, software/hardware installation fees, or inflated delivery charges. There's never a restocking fee.

100% FINANCING

Low Cost Leases

Business accounts may lease with 100% financing for up to 60 months. Leasing covers all hardware, peripherals, software and accessories.

SOFTWARE INSTALLED FREE OF CHARGE

Software Installed Free

Avoid the time and hassle of installing software. Software ordered with your system is installed for free.

TWO-DAY DELIVERY $19.95 GUARANTEED

2nd Day Delivery

Place your standard order by 6 P.M. E.T. and receive it in two business days for only $19.95 per package. Guaranteed.

Ask your sales consultant for compleat details.

DIRECT TOP FORTY **PC Computing** FIVE STAR AWARD

PCs Compleat is the proud recipient of PC/Computing magazine's highest Five Star rating for service and overall performance in its listing of the nation's leading direct sellers.

SPECTACULAR SAVINGS ON SOFTWARE

Buy your software from PCs Compleat and we'll install it for you FREE of charge. Choose from thousands of titles. In addition, through our Software on System program, we'll offer you unbelievable savings on some of the most popular titles available, including:

Lotus SmartSuite 2.1NEW!	$374.99*
Lotus SmartSuite 2.1NEW! Upgrade	$289.99*
Lotus 1-2-3 Release 4.0	$259.99*
Lotus AmiPro	$209.99*
Norton Utilities	$79.99*
Norton Desktop for Windows	$79.99*
Norton pcAnywhere	$89.99*
WinFax Pro	$59.99*
LapLink V	$69.99*

SOFTWARE On SYSTEMS

PCM-1/94B

PCs COMPLEAT

THE BEST: BRANDS · PRICE · DELIVERY · SERVICE

Sales Hours:

Monday-Friday 9 A.M. E.T. -Midnight
Weekends & Holidays 10 A.M.- 8 P.M.

TOLL-FREE SALES

1-800-775-4727

CIRCLE 092 ON READER SERVICE CARD

When Midwest Computer Works made PC Direct their driving force, sales took off at top speed.

Midwest Computer, co-founders, Steve Melnick and Susan Freed

MIDWEST COMPUTER WORKS

When Midwest Computer Works opened for business in 1989, co-founders Steve Melnick and Susan Freed had a vision of one day becoming a successful global enterprise. They made this happen by embracing a customer-oriented philosophy and by specializing in networking and laptops. Whether it's shipping orders the same day they're ordered, offering easy access to technical support from certified Netware engineers, or upgrading the telephone systems so every call is answered by a real-live person, Midwest Computer Works works.

In fact, it's working so well that they're preparing for a massive growth period. Steve Melnick says, "We've redesigned our infrastructure to handle it so that we're ready to now increase our staff and almost double the size of the company." Obviously, Midwest Computer Works' approach and its 100% commitment to its customers paid off. And of course, it didn't hurt that they selected a winning media strategy.

Even though they started small, they didn't let size stand in the way of their big dreams. "We started from nothing and went right into PC Magazine," says Melnick. "And we found instant success from that. Which is part of the reason why we're so successful today, because we didn't start with some of the smaller magazines trying to work our way up."

"We decided that we wanted to be a major player in the mail order business in the United States. And in order to do that, when we did our research, it showed that PC Magazine was the place to be. The response has been great. We've noticed an increase in our business based on the amount of subscribers that have been added."

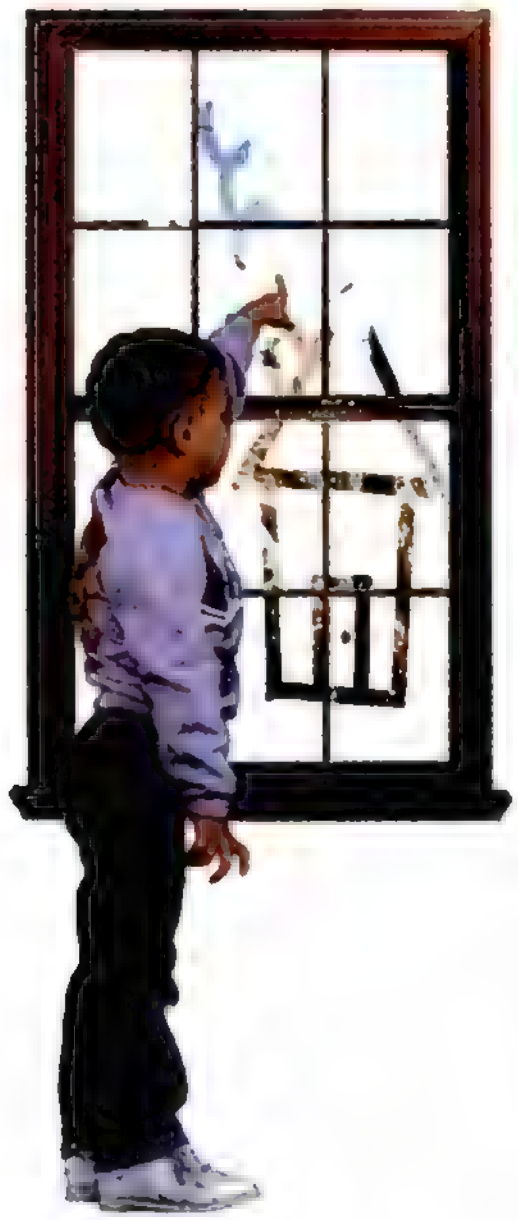
With PC Magazine, "Your return on your investment is the highest, because you see immediate results. PC Magazine was our first buy. And from day one, it gave us credibility and great response. When you commit to every issue, customers soon realize you're a sizable company and here to stay. We've moved to two pages in PC Direct. It's where business buyers shop for their favorite vendors. And with twice the ad space, we're bracing for warp speed."

Move your sales into high gear. If you're a direct marketer with a breakthrough idea, bring it to the attention of 1,000,000 of the most active and knowledgeable PC buyers. Call your PC Magazine sales representative or 212-503-5100 and get the facts about PC Direct.

PC DIRECT

The Purchasing Source for Direct Buyers

Drawing With Windows Has Come A Long Way



Creating designs with windows is still as much fun as it used to be. But, with DesignCAD for Windows, you don't have to worry about your mother scolding you for leaving fingerprints on the window! DesignCAD, maker of the highest quality, lowest price CAD system, has just introduced DesignCAD for Windows. DesignCAD for Windows is not just the same DOS program rewritten to run on the Windows platform. It is a totally redesigned CAD program showcasing many new and exciting features that cannot be found on competing Computer-Aided Design programs. We had an idea that you would want a complete design package. So we included everything you'll need to create anything you want! Other CAD packages don't have the foggiest!

And you don't have to sell your house to afford these Windows! You will pay no more than $349. And just look what you get with DesignCAD for Windows:

- ***HOT TOOLBOXES***- *These are on-screen toolboxes that you create to fit your needs.*
- ***QUICK CHANGE EDIT BOXES***- *Edit any aspect of your drawing by simply changing its specifications.*
- ***INTELLICURSOR***- *The cursor actually changes to let you know when you are touching the element you are wishing to select.*
- ***IMPORT/EXPORT***- *Drawings can be imported from virtually any CAD package (even DOS) for use in DesignCAD for Windows.*

To order, call or fax for a dealer near you. If you would like more information, we will rush to you a 16-page color brochure and Demo Disk to clear up any questions you might have about DesignCAD for Windows!

December 17,1991

American Small Business Computers
One American Way, Pryor, OK 74361
Phone: (918)825-7555
Fax: (918)825-6359
CIRCLE 025 ON READER SERVICE CARD

Not more than $349

WE WILL TRY TO MATCH OR BEAT ANY ADVERTISED PRICE CALL FOR LATEST PRICING!!

WE ACCEPT PO'S FROM QUALIFIED FIRMS

M E M O R Y

NO SURCHARGE FOR MC, VISA AE & DISCOVER

CACHE MEMORY

	12NS	15NS	20NS	25NS
8Kx8	–	6.50	6.00	5.50
32Kx8	28.00	9.00	8.00	7.00
64Kx1	–	11.00	9.00	8.00
64Kx4	–	11.00	9.00	8.00
16Kx4	–	8.00	7.00	6.00
128Kx8	–	–	49.00	36.00

Individual D-RAM Chips

MEMORY FOR IBM & APPLE

	80NS	70NS	80NS	100NS
1Megx1	7.35	7.25	6.75	4.95
1Megx4	35.00	29.00	27.00	–
1Megx4 (Zip Pack)	25.00	23.00	21.00	–
256 x 4 (Video Zip)	–	–	11.95	10.95
256x4	4.75	4.50	–	–
256 x1	3.00	2.75	2.50	2.25
256 x16VRAM	–	39.00	39.00	–
64x4	–	–	3.25	–
64x1	–	–	–	2.00

INTEL Math Chips

8087	45.00
8087-2	49.00
8087-1	85.00
80287-XL	55.00
80387-16 DX	45.00
80387-20 DX	55.00
80387-DX (Does All)	79.00
80487-DX (Does All)	339.00
Intel SX (Does All)	79.00
Intel SL Mobil	85.00
Intel 16SX	49.00
Intel 20SX	54.00

Change Your 386 to a 486DLC

JUST CHANGE CPU

• Plug Compatible • Cache Software • Uses 387 Math Chip
• 50-94% Faster • DOS & WINDOWS Compatible

			Landmark V 2.0
Cyrix 486 DLC	40MHZ	199.00	130
	33MHZ	179.00	107.2
	25MHZ	118.00	A/A
Cyrix 486 SLC	33MHZ	159.00	103.5
	25MHZ	126.00	78.4
Cyrix 486 DRx²		Call	

CYRIX DRx² 386 to 486 Upgrade

Clock Doubler

- Single chip upgrade solution
- Clock doubling technology
- Compatible with industry standard 386SX CPU socket
- Compatible with DOS, Windows, 3.X, OS/2 1.3 and 2.x
- Uses industry standard math chip
- Easy to install—about 15 minutes

The Cyrix upgrade runs at twice the speed of your original 386 microprocessor combined with a 1K on-chip cache you will enjoy a performance boost of 100% and more. Ideal for any DOS, Windows or OS/2 application which requires a large amount of microprocessor horsepower.

CX486 DRx²-16/32	259.00
CX486DRx²-20/40	299.00
CX486 DRx²-25/50	359.00
CX486 33/66	CALL
CX486 SRX2 16/32	249.00
CX486 SRX2 20/40	249.00
CX486 SRX2 25/50	CALL

SIMM MODULES (Add $5.00 for SIPP)

	40NS	50NS	60NS	70NS	80NS	100NS
1Meg x 9 (3 chip)	51.00	51.00	47.00	45.00	44.00	–
1Meg x 9 (9 chip)	63.00	–	56.00	54.00	52.00	43.00
4Meg x 9	–	–	165.00	159.00	149.00	–
16Meg x 9 (9 chip)	–	–	829.00	–	–	–
16Meg x 9 (36 chip)	–	–	–	–	–	–

72 PIN SIMMS (EISA)

256 x 36 1Meg	–	–	–	–	59.00	–
512 x 36 2Meg	–	–	–	94.00	87.00	–
1 x 36 4Meg	–	–	214.00	199.00	189.00	–
2 x 36 8Meg (w/pal)	–	–	449.00	429.00	379.00	–
2 x 36 8Meg (w/o pal)		–	424.00	444.00	449.00	–
4 x 36 16Meg		–	709.00	679.00	679.00	–
8 x 36 32Meg	–	–	1699.00	1599.00	1599.00	–
16 x 36 64Meg	–	–	3699.00	3499.00	–	–

CYRIX FASMATH PROCESSOR

Programs executed up to 3X faster • Plug & object code compat. w/Intel
83D87-40MHz – 99.00 83D87-33MHz – 79.00 83S87-25SX Ver – 89.00
83S87-33SX – 89.00 PC Week™ rated #1 over all math chips
5 Year Warranty • "All Downward Compatible"

AST MEMORY

MODEL	AMT. UPGRADED	AST PART #	PRICE
Bravo LC 4/25S, 4/33, 433S, 4/50L, 4/66	2Meg	500967-001	CALL
	4Meg	500967-002	199.00
	8Meg	500967-003	419.00
	16Meg	500967-004	819.00
	32Meg	500967-005	1399.00
Premium 486/25, 25E, 33, 33E			
Premium 386/33TE, 486/25TE, 33TE			
Prem. Serv., Prem II 386SX/20, 25			
Prem. II 386/25, 386/33, 486/33, 486SX/20	8Meg	500780-001	396.00
Premium 386/33T Prem. 386SX/16			
Prem. II 386SX/20, 25		500780-004	199.00
Premium 386/25, 33, 386/25T, 386SX/16,		500780-003	59.00
Prem. II 386SX/20,25		500780-001	39.00
Premia	8Meg	501159-002	CALL
Premia	16Meg	501159-003	CALL
Premia	32Meg	501159-004	CALL
Premia	64Meg	501159-005	CALL

ZENITH MEMORY MODULES

MODEL	AMT. UPGRADED	AST PART #	PRICE
Z386/33, 25, 20, 33E	1Meg	ZA3800ME	59.00
Z386/33, 25, 20, 33E, 486/25E	4Meg	ZA3800MK	195.00
Z386SX	2Meg	Z-805-1 modules	119.00

MAGNAVOX

286/386SX-16, 386SX-20, 486SX-20 & 386-33 *all are 72PIN SIMM*
1MEG – 59.00 4MEG – 183.00 8MEG – 429.00 16MEG – 689.00

MEMORY BOARDS

IBM Compatibles & PS/2

BOCA AT PLUS

USES SIMMS

16 BIT MEMORY BD. FOR 286, 386 AT • OK-8Meg Bd. 4.0 LIM Compat. • New 5 Yr. Warr. Convent., Expnd. & Extnd. Memory • Supports DOS, OS/2, LIM/EMS & EEMS • Versatile Split Memory Addressing • Operates w/CPU Speeds to 33 MHz • Supports Desqview, Multitask operations • *Bd. made by Boca Research, AT plus*
OK – $99.00 2Meg – $177.00 4Meg – $285.00 8Meg – $441.00

BOCA XT 8 BIT BUS

• Expanded memory for XT • Lim 4.0 compat. 0-2Meg • Uses 256x1-100
0-K – $99.00 1Meg $179.00 2Meg – $219.00

IBM P/S2 32BIT EXPANSION BD.

0-32Meg, Ext.-Expnd. Memory Bd. for P/S2 70, 80, 90, Lim 4.0

0Meg	2Meg	4Meg	8Meg	16Meg	32Meg	64Meg
$179.00	$268.00	$374.00	$569.00	$959.00	$1935.00	$3255.00

PS/2 MCA 0-8MEG EXPANSION BD.

0-8Meg Extended and/or Expanded Memory for all IBM P/S2 Models 50, 50Z, 60, 55SX, 65SX, 16 Bit, 4.0 LIM Compat.
0K – 119.00 2Meg – 287.00 4Meg – 285.00 8Meg – 471.00

USES 1 X 9 SIMMS BOCA BR MC-80

IBM PS/1, PS/2 MEMORY MODULES

IBM PART NO.	WORKS WITH MODEL NO.	PRICE
30F5348 (512K)	30-286	37.00
90F5360 (2Meg)	30-286, 25-286, 50 MTHR BD.	104.00
6450375 (1Meg)	80-041	79.00
6450379 (2Meg)	80-111, 311-121, 321, 061, 161	84.00
6451060 (4Meg)	80-A21, A-61, 80-A31, 80-111, 80-311	170.00
6450604 (2Meg)	70-061, E61, 121, 50Z, 55SX, 65SX, P-70, 55LS, 65LS, X-Station 120 & 130, 35SX, 35LS, 40SX	89.00
6450608 (2Meg)	70-A21, A-61, B-21, B-61, 35SX, 35LS, 40SX, Val PL 325T	90.00
78X8955 (128K)	25	35.00
34F2933 (4Meg)	35SX, 40SX, 55SX, 65SX, 55LS, 85LS	185.00
87F9977 (4Meg)	55SX, 55LS, 65SX, 40SX, 35SX, 35LS	185.00
1057035 (512K)	P/S1-286	49.00
92F9935 (2Meg)	P/S1 & P/S1/386SX-2121	99.00
92F9694 (4Meg)	P/S1 & P/S1/386SX, Model-2121	189.00
6450902 (2Meg)	56, 57, 57SX, 90, 95, P-75, 57SLC Value Point 77 486DX2, 486SX, SVR 85	95.00
6450128 (4Meg)	57SX, 90, 95, P-75, 57SLC, 56, 56SLC, P/S1, 386SX, Mod-2123, 2133, 2155, Val Pt 77, 486CS2, 486SX, SVR85 Value Point 77 486DX2, 486SX, SVR 85	189.00
6450129 (8Meg)	35SX, 40SX	399.00
6450130 (8Meg)	56, 57, 57SX, 90, 95, P-75, 57SLC Value Point 77 486DX2, 486SX, SVR 85	399.00
4010 (16 Meg kit)	RISC System/6000	CALL
4033 (32 Meg kit)	RISC System/6000	CALL
4036 (64 Meg kit)	RISC System/6000	CALL

IBM NOTEBOOK & LAPTOP MEMORY

AMBRA NC 425SL 2,4,8		109.00/209.00/449.00
79F0999 (2Meg)	LX40, N33SX, PS Note	103.00
79F1000 (4Meg)	LX40, N33SX, PS Note, Thinkpad 350, 350c	199.00
79F1001 (8Meg)	LX40, N33SX, PS Note	349.00
07G1826 (2Meg)	N51 (all)	103.00
07G1827 (4Meg)	N51 (all)	199.00
07G1828 (8Meg)	N51 (all)	419.00
07G1414 (2Meg)	Thinkpad 750, 750c	119.00
07G1415 (4Meg)	Thinkpad 750, 750c	239.00
07G1416 (8Meg)	Thinkpad 750, 750c	449.00
66G0094 (16Meg)	Thinkpad 750, 750c	1149.00
07G1420 (4Meg)	CL57LSX LpTp, Thinkpad 700, 700C, 720, 720C	229.00
07G1421 (8Meg)	CL57LSX LpTp, Thinkpad 700, 700C, 720, 720C	439.00
60G0378 (8Meg)	Thinkpad 350, 350c	359.00
60G0379 (16Meg)	Thinkpad 350, 350c	759.00
92F6804 (2Meg)	N45SL	109.00

COMPAQ MEMORY MODULES

MODEL	AMT. UPGRADED	CMPQ PART #	PRICE
DeskPro 386/33, 386/33L, 486/25, 486/33L, 486/50L, System Pro	2Meg Module	115144-001	109.00
	8Meg Module	116561-001	429.00
	32Meg Module	116568-001	1459.00
DeskPro 386/33L, 486/33L	(Exp Bd)	116589-001	279.00
DeskPro 386/25, 386/20	1Meg Module	113131-001	79.00
	4Meg Module	113132-001	209.00
DeskPro 386S-16MHz	1Meg Exp Bd	113633-001	149.00
	4Meg Exp Bd	113634-001	329.00
	1Meg Module	113646-001	79.00
	4Meg Module	112534-001	229.00
DeskPro 386/20E	1Meg Exp Bd	113644-001	149.00
DeskPro 386/25E	4Meg Exp Bd	113645-001	329.00
	1Meg Module	113131-001	79.00
	4Meg Module	113132-001	229.00
DeskPro 286N, 386N, 386SX/20, 386/25M, 486/33M, 486S/25M, 486S/16M	1Meg Module	116688-001	59.00
	2Meg Module	116689-001	89.00
	8Meg Module	116690-001	163.00
Port. 486C	8Meg Module	128877-001	399.00
M Series Exp Bd	0-64Meg	129160-001	279.00
DeskPro 386/16	1Meg Kit	108071-001	99.00
	4Meg Kit	108072-001	299.00
	1-2Meg Exp Bd	108069-001	239.00
	4-8Meg Exp Bd	108070-001	437.00
DeskPro 286	512K Kit	113012-001	49.00
DeskPro 5/60, 5/66M	8Meg Kit	149911-001	389.00
DeskPro 5/60, 5/66M	16Meg Kit	149949-001	789.00
DeskPro 5/60, 5/66M	32Meg Kit	149912-001	1659.00
DeskPro 5/60, 5/66M	64Meg Kit	149913-001	2699.00
DeskPro 5/60, 5/66M	128Meg Kit	149914-001	7199.00
Proliness 386 3/25S, 3/25ZS	2Meg	141738-001	109.00
	8Meg	141742-001	320.00
Proliness 486 4/25S, 4/33, 4/50, 4/66, CDS	2Meg	141683-001	95.00
	4Meg	141684-001	189.00
	8Meg	141685-001	429.00
Prosignia PC Server, 486/33, 486 DSX/66	8Meg	141685-001	429.00
	16Meg	149320-001	689.00
	32Meg	149147-001	1525.00
Prosignia 5/60	16Meg	139132-003	739.00
Prosignia 5/60	32Meg	139132-004	1659.00
Prosignia 5/60	64Meg	139130-001	2799.00
Prosignia 5/60	128Meg	139132-007	6199.00

COMPAQ LAPTOPS & NOTEBOOKS

LTE/286	2Meg Bd	117081-002	99.00
LTE/286	4Meg Bd	117081-003	179.00
LTE/386S/20	4Meg Module	121125-002	239.00
LTE LITE/20, 25, 25C	4Meg Module	129769-002	239.00
LTE LITE/20, 25, 25C	8Meg Module	129769-003	399.00
LTE LITE/20, 25, 25C	16Meg Module	129769-004	809.00
LTE LITE 4/25C, 4/23E, 433C	4Meg Module	142337-002	219.00
LTE LITE 4/25C, 4/23E, 433C	8Meg Module	142337-003	429.00
LTE LITE 4/25C, 4/23E, 433C	16Meg Module	142337-004	789.00
SLT/286	1Meg Module	110235-001	75.00
SLT/286	4Meg Module	110237-001	249.00
SLT/386	1Meg Module	118303-001	79.00
SLT/386	2Meg Module	118304-001	109.00
SLT/386	4Meg Module	118305-001	219.00
Contura 320, 325	2Meg	139497-001	109.00
	4Meg	139498-001	189.00
	8Meg	139499-001	369.00
Contura 4/25, 4/25C, 4/25CX	4Meg	146520-001	189.00
	8Meg	146521-001	369.00
	16Meg	146531-001	799.00

PCMCIA VERSION 2.0

(for Palmtop & Subnotebooks)

MODEL	PRICE
S-RAM Cards 1MEG	159.00
S-RAM Cards 2MEG	179.00
Card Pro (made by Data I/O) Transfers data from PCMCIA cards to desktop PC, connects to a parallel port	299.00

MODEL	PRICE
14,400/14,400 Data/Fax Modems	319.00
9600/9600 Data/Fax Modems	259.00
2400/9600 Data/Fax Modems	179.00
Lan Ethernet (10 Base T)	219.00
Visual Media (CD Rom, Tape Dr)	279.00

FLASH MEMORY

2.5Meg 299.00 5Meg 419.00 10Meg 689.00 15Meg CALL 20Meg CALL

NO SURCHARGE FOR MASTERCARD, AMEX, VISA OR DISCOVER. PURCHASE ORDERS ACCEPTED FROM FORTUNE 2000, GOVERNMENT & INSTITUTIONS. California orders add 8.25% sales tax. Returned orders or ordered wrong parts are subject to a 20% restocking fee. (Memory chips not installed in boards.) We accept international orders shipped via UPS Air. APO, FPO orders welcome. Customers are expected to pay customs and "other" charges if shipped Int'l. All credit card charges verified for fraudulent use. SORRY, NO REFUNDS AFTER 30 DAYS - EXCHANGES ONLY. We accept MC, VISA, Discover, AE, prepaid orders, purchase orders, wire transfer, COD (cashiers check) orders, cash & cashiers checks. Orders shipped by UPS, FEDX must be signed for
• ALL MANFACTURER PART #'S ARE FOR REFERENCE ONLY • MINIMUM ORDER $40.00.
Price and availability subject to change without notice.

All products brand new & guaranteed • We buy excess inventory

Trademarks are registered with their respective companies.

L.A. TRADE

22825 Lockness Avenue • Torrance, CA 90501

TOSHIBA LAPTOP MEMORY

MODEL	AMT. UPGRADED	MANU. PART #	PRICE
T1000SE/XE/LE	2Meg	PC14-PA8312U	94.00
T2000/T2000SX	2Meg	PC19-PA8317U	94.00
T2000SX/T1000LE	4Meg	PC-PA8314U	219.00
T2000SX/T1000LE	8Meg	PC14-PA8315U	419.00
T2000SXE/2200SX/T1800, 1850, C	2Meg	PC-PA2000U	94.00
T2000SXE/2200SX/T1800, 1850, C	4Meg	PC-PA2001U	219.00
T2000SXE/2200SX/T1800, 1850, C	8Meg	PC-PA2002U	419.00
T4400SX, SXC T6400	4Meg	PC-PA2004U	219.00
T4400SX, SXC T6400	8Meg	PC-PA2005U	419.00
T4400SX, SXC T6400	16Meg	PC-PA2010U	713.00
T4500, T4500C, T4600, T1900, T1900C (3.3 v)	4Meg	PC-PA2012U	249.00
T4500, T4500C, T4600, T1900, T1900C (3.3 v)	8Meg	PC-PA2013U	478.00
T4500, T4500C, T4600, T1900, T1900C (3.3 v)	16Meg	PC-PA2014U	1399.00
T3300SL	4Meg	PC-PA2007U	234.00
T3300SL	6Meg	PC-PA2008U	349.00
T3300SL	8Meg	N/A	489.00
T3300SL	16Meg	PC-PA2009U	719.00
T1200XE	2Meg	PC13-PA8308	99.00
T1600	2Meg	PC8-PA8302U	99.00
T3100	2Meg	PC3-PA7135E	179.00
T3100e	2Meg	PC9-PA8340U	109.00
T3100SX	2Meg	PC15-PA8308U	109.00
T3100SX	4Meg	PC16-PA8310U	209.00
T3200	3Meg	PC6-PA7137U	185.00
T3200SX	2Meg	PC12-PA8307U	119.00
T3200SX	4Meg	PC12-PA8909	209.00
T3200SXC	2Meg	PC19-PA8318U	119.00
T3200SXC	4Meg	PC19-PA8319U	219.00
T5100	2Meg	PC7-PA8301U	86.00
T5200/T8500	2Meg	PC10-PA8304U	114.00
T5200/T8500	8Meg	PC10-PA8313U	419.00

NOTEBOOK LAPTOP MEMORY

MODEL	AMT. UPGRADED	MANU. PART #	PRICE
ACER 730	2Meg/4Meg/8Meg		109/209/449
ACER 750	4Meg/8Meg/16Meg		199/459/869
ALR Venture	4Meg	12407980	279.00
AST Notebook Prem Exec 386SX/20/25/25L	4Meg	500814-003	169.00
AST Power Exec 3/25C, 425EL	4Meg		199.00
AST Power Exec 3/25C, 425EL	16Meg		819.00
AST Power Exec 425SL	4Meg	801166-001	199.00
AST Power Exec 425SL	16Meg	801166-003	819.00
AT&T Safari NSX/20	4Meg	PEC 37651	299.00
Bondwell B316, Plus	1Meg	23050-08109	109.00
Bondwell B316V, SX	1Meg		109.00
Bondwell B310V, SX	4Meg		229.00
Epson NB3	4Meg	A808511	199.00
Everex Tempo LX, LX20, Carrier	2Meg	PCA 00053-0001	99.00
Gateway 2000 Nomad 425 DX0,/SX0,	4Meg/16Meg		199.00/1549.00
Goldstar GS520 386SX/16	4Meg	S386-4M	299.00
Magnavox Metalis	1Meg, 4Meg	286, 386SX	109.00,199.00
NEC Prospeed 286, 386SX-16	1Meg	PC21-21	79.00
NEC Prospeed 286, 386SX-16	4Meg	PC21-22	199.00
NEC Prospeed 386	2Meg	PC31-21	119.00
NEC Prospeed 386	8Meg	PC31-22	399.00
NEC Prospeed 386SX-20	1Meg	PC43-21	79.00
NEC Prospeed 386SX-20	4Meg	PC43-22	199.00
NEC Ultralite III/20, 20P, 25C	2Meg	PC47-21	109.00
NEC Ultralite III/SL/25C	4Meg	PC47-22	199.00
NEC Ultralite SL/20, 20P	8Meg	PC49-21	309.00
NEC Ultralite III/25C	8Meg	PC47-23	389.00
NEC Ultralite Versa	4 Meg/8Meg/16Meg/20Meg	CP4104	209, 429, 849, 104
Packard Bell 386SX, 286	1Meg, 4Meg	286, 386SX	109,199
Panasonic CF170, CF270, CF370	1Meg	CF-BA186	49.00
Panasonic CF380	2Meg/4Meg/8Meg		CALL/CALL/CALL
Panasonic CF480	2Meg/6Meg		CALL/CALL
Sanyo 17/18 NB	2Meg	MBC-N8MEM2	99.00
Sharp 6781, 6861, 6785	2Meg/4Meg		109.00/199.00
Sharp PC-6220	1Meg	CE 021B	79.00
Tandon, PC Brand, Dataworld	2Meg, 8Meg	N8386SX-20	119.00, 429.00
TI Travelmate 2000	1Meg	2568034-0001	79.00
TI Travelmate 3000	2Meg	2568896-1	84.00
TI 4000	4Meg, 16Meg		199.00, 1849.00
Twinhead, Altima, Compudyne Tandy 4860, 486SX, DX	4Meg/16Meg		199.00/659.00
Zeos 386SX Notebook	2Meg		99.00
Zenith Master Sport 386SX	2Meg	ZA-300-1	114.00
Zenith Master Sport SL, SLE	2Meg	ZA-4-4	119.00
Zenith Super Sport 286, 286E	1Meg	ZA-180-86	99.00
286E, SX	2Meg	ZA-180-84	179.00
SX Alpha	2Meg	ZA-180-86	179.00
SX Beta	2Meg	ZA-180-87	179.00
Zenith Z-Note 325L, LC	2Meg/8Meg	ZA3250-4/8	129.00/419.00
Zenith Z-Note 425LM, LNC, LNP	4/8/16Meg		269/519/839

LASER PRINTER MEMORY UPGRADES

AMOUNT UPGRADED OK Bd	256k	1	2	3	3.5	4	5	6	8	16	32
Canon LBP4, 4Lite, 4plus	–	–	159	219	–	–	–	–	–	–	–
Compaq Pagemarg	–	–	–	99	–	–	195	–	–	389	–
Epson 6000, Action Laser	–	–	–	125	–	–	209	–	–	–	–
Epson Action Laser II	–	–	89	–	Call	–	–	Call	–	–	–
Epson 8000	–	–	89	–	Call	–	–	Call	–	–	–
Epson 1000, 1500	–	–	–	Call	–	–	Call	–	Call	–	–
HP 2, 2D–	–	–	–	119	–	–	199	–	–	–	–
HP 3, 3D, 3P, 2P 2P+	–	–	–	109	–	–	189	–	–	–	–
HP 4, 4M, 4SI, 4SIMX	–	–	–	89	–	–	195	–	–	399	–
HP 4L	–	–	59	–	–	–	–	–	–	–	–
HP 3SI	–	–	89	–	–	–	189	–	–	379	–
HP 4SI	–	–	–	89	–	–	189	–	–	379	–
HP Design Jet 600	–	–	–	–	–	–	189	–	–	379	–
HP Deskjet 500, 500C, 550	–	59	–	–	–	–	–	–	–	–	–
HP Deskjet 1200C, 1200C/P–		–	–	89	–	–	189	–	–	379	–
HP Paintjet XL300	109	–	–	–	–	–	304	–	–	499	907
IBM Laser 4019, 4019E	–	–	–	–	–	169	–	–	–	–	–
IBM Laser 4029	–	–	–	–	–	–	189	–	–	–	–
IBM Laser 4039, 4079	–	–	–	99	–	–	189	–	–	389	–
NEC 90, 290	–	–	–	139	–	–	–	–	–	–	–
NEC 95, 97	–	–	–	99	–	–	–	–	–	–	–
Oki 400	–	–	–	89	–	–	–	–	–	–	–
Oki 400 E	–	–	135	189	–	–	–	–	–	–	–
Oki 830, 840	–	–	–	109	–	–	–	–	–	–	–
Packard Bell PB 9500	–	–	–	124	–	–	209	–	–	–	–
Panasonic 4420/4450I	–	–	–	129	–	–	209	–	–	–	–
Panasonic 4410/4430	–	–	–	128	–	–	195	–	–	–	–
Panasonic 4450	–	–	99	–	–	–	–	–	–	–	–
TI XL/PS17/PS35	–	–	55	–	–	–	–	–	–	–	–

H.P. COMPATIBLE FONT CARTRIDGE

BAR CODES Bar Code Reader Fonts 99.00
DESKJET SOLUTION for DeJ 500 & Plus, 92 Fonts, 4.5 pt-30 pt 99.00
IBM 4019, 4019E, FONT CARTRIDGE 209 Fonts, Turbo Card 105.00
TURBO 25 Comparable to Pacific Data's 25 CARTRIDGES IN ONE!™, 143 Fonts *(compat. with Epson Action Laser II and all HP Printers except HP4)* 69.00
TURBOSCRIPT™ 109, 109 Scalable Fonts to Any Point Size (HP 2, 2D – 139, 159, 199) 179.00
TAX & FINANCE FOR IBM 4019, 4019E, 4029 ..... 139.00
TAX & FINANCE CARTRIDGE 84.00
OKI 400, 800 41 fonts, 11 typestyles 169.00

310-539-0019
FAX: 310-539-5844

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

CALL TOLL FREE **1-800-433-3726** (US and Canada)

ESTAB. 1985

SORRY, NO WILL CALLS

Mon-Fri, 8:00 a.m. to 5:00 p.m. PST
Sat. 10:00 a.m. to 12:00 noon

PRICES MAY FLUCTUATE CALL FOR LATEST PRICING!!

CIRCLE 019 ON READER SERVICE CARD

MAIN STREET COMPUTER COMPANY'S

NETWORK EXPRESS

CONNECT WITH US

NOVELL SOFTWARE

NEW

NetWare V3.12 5 User $589

Novell 3.12 5/10 User	589./1,299.
Novell 3.12 25/50 User	1,899./2,559.
Novell 3.12 100/250 User	3,509./Call

NetWare V4.0 5 User $895

Novell 4.0 5/10 User	895./2039.
Novell 4.0 25/50 User	3,195./3,999.
Novell 4.0 100/250 User	5,599./9,998.
Novell 4.0 500/1000 User	16,834./30,609.
Novell 2.2 5/10 User	469./1,049.
Novell 2.2 50/100 User	2,079./2,969.
NetWare Encyclopedia	Special 895.
Novell Netware Lite/Lite + Dr DOS	69./99.
Novell NFS/386 NLM	3,499.
LAN Workplace for DOS	319.

Upgrade Your Existing Novell To a Newer Version or Add Users & Save ! Call For Details.

TAPE DRIVES

$795 COMPLETE
1.5 Gigabyte Internal Kit
$1,049
TAPE BACKUP External Kit

- Data Transfer up to 30MB/Minute
- File SECURE Software + SCSI 2 Interface & Cable + 2 Year Drive Ship Warranty from MTI + Free Tape Included

Colorado Powertape 2.1 GB Internal	1,099
Colorado Powertape 4.0 GB Internal	1,695
Colorado Powertape 1.5 GB Internal	1,279
Colorado Powertape 4.0 GB External	1,899.
Colorado Powertape SCSI Controller	169
Colorado Powertape Cartridge 2/4 GB	56./84
Colorado FlowerDAT 6000 4.0 GB Internal	1,695
Conner 2.0 GB Internal	1,299
Conner 4.0 GB Internal	1,699
Conner Turbo Python 4.0 GB DAT Internal	1,399
Conner Turbo Python 4.0 GB DAT External	1,599
Exabyte 8 mm 2.0 GB Tape Internal	895
Exabyte 8 mm 5.0 GB Tape External	4,295
Exabyte Mammoth 8mm 14GB Tape External	7,995

WIDE • AREA NETWORKING

Retix 2265 Local Ethernet Bridge $1,399

BRIDGES/ROUTERS

D-Link 1100 Local Bridge	1,679
D-Link 1140 Remote Bridge	2,949
D-Link 1120 Remote Bridge	1,659
DeveCon 120x 2 port Local Bridge	1,495
DeveCon 102 LYX Dual Link Remote Bridge	3,189
Intellicom Quicknet	2,949
Intellicom Quicknet 6000 Bridge	997
Intellicom Quicknet	2,949
Novell Multiprotocol Router	729
Retix 3660 Local Token Ring Bridge	4,899
Retix 3880 Remote Token Ring Bridge	5,399
Retix 4760 Local Ethernet Bridge/Router	2,249

CSU/DSU

Astrocom 2300 Variable Speed CSU/DSU	649.
Astrocom NX1 T1 CSU/DSU	1,495
Penril 56K CSU/DSU	399
Penril 56 96 CSU/DSU	475
Penril T1 CSU/DSU	579

NETWORK UTILITIES

Cheyenne Utilities for Netware $269

Brightwork LAN Support Center	439.
Brightwork Utilities for NetWare	379.
Central Point Antivirus NLM	1,750
Central Point Antivirus NLM 1 ?	899
Corel SCSI Driver	79.
Cheyenne InoCULAN NLM 20/250 User	329/659.
Cheyenne Utilities for NetWare	269.
Intel LanDesk	739.
Intel LanDesk Manager	739.
Inocolan NLM 20 User	339
Novell Computer Based Training Net Technology	679.
Novell Computer Based Training Intro to Networking	219.
Saber LanPack 10/25/100 User	279/495/1,769.
Xtree Tools for NetWare	549.

FREE SOFTWARE EVALUATION As a special service to our customers, Network Express we are pleased to offer [illegible] Novell Netware Lite, Lite server and Netware® [illegible] GETTING WHAT YOU WANT! The above configurations are examples of outstanding values available when the advertisement was published. However, depending on your requirements, we may be able to improve on the price or provide you with a system more exactly what you want at the same low pricing level.

NOVELL CERTIFIED LAN EQUIPMENT •

$569 386 40SX *Workstation*
- 2MB RAM
- 16 Bit Ethernet Adapter
- 1 44MB FDD
- IDE HD/FDD Controller
- Monochrome VGA Monitor
- Mono VGA Adapter

$969 386 SX/DX 40MHz
- 1MB RAM
- 64K RAM Cache
- 16 Bit Ethernet Adapter
- 80MB HD
- Choice of 1.2 or 1.44MB FDD
- 28MM SVGA Color Monitor
- 1MB SVGA Adapter

$1199 486 25SX 130MB SVGA
- 4MB Ram
- 64K RAM Cache
- 16 Bit Ethernet Adapter
- 130MB HD
- Choice of 1.2 or 1.44MB FDD
- .28MM SVGA Color Monitor

$2079 486 DX 66MHz LOCAL BUS
- 8MB Ram
- 256K RAM Cache
- 16 Bit Ethernet Adapter
- 250 MB HD-VL-BUS
- Choice of 1.2 or 1.44MB FDD
- .28MM SVGA Color Monitor
- VL-BUS 1MB VGA Adapter

- All Novell Certified (Barebone)*
- All FCC Class B Approved
- All Desktop or Mini Tower Case
- All 101 Enhanced Keyboard

WORKSTATIONS & FILE SERVERS

$1299 486DX 33MHz
- 4MB RAM
- 64K RAM Cache
- 16 Bit Ethernet Adapter
- 250MB HD
- Choice of 1.2 or 1.44MB FDD
- Monochrome VGA Monitor
- 101 Enhanced Keyboard
- Novell Certified (Barebone)*
- FCC Class B Approved

$1849 486 DX2 66MHz
- 8MB RAM
- 64K RAM Cache
- 16 Bit Ethernet Adapter
- 340MB HD
- Choice of 1.2 or 1.44MB FDD
- Monochrome VGA Monitor
- Novell Certified (Barebone)*
- FCC Class B Approved

$1995 486 DX2 66MHz VL-LOCAL BUS
- 8MB RAM
- 256K RAM Cache
- 16 Bit Ethernet Adapter
- 340MB HD
- Choice of 1.2 or 1.44MB FDD
- Monochrome VGA Monitor
- IDE VL-BUS Adapter
- Novell Certified (Barebone)*
- FCC Class B Approved

$3695 486 EISA 50MHz
- 8MB RAM
- 256K Cache
- EISA SCSI Adapter
- 540MB SCSI HD
- Both 1.2 & 1.44MB FDD
- Monochrome VGA Monitor
- VGA Video Adapter
- 300 Watt Power Supply
- Novell Compatible

10 BASE T PRODUCTS

16 + 2 PORT 10 BaseT HUB
- 16 – 10 BaseT Ports
- 1 – Coax Port
- 1 – AUI Port
- 26 - LINK/Rx LED's
- IEEE 802.3 Ethernet Compliant Repeater

$499
8 PORT $229

HUBS

Asante 8 Port 10 BaseT Hub	269
Boca 8 Port 10 BaseT Hub	249
Canary 24 Port 10 BaseT Hub	899
SMC [illegible] 10 BaseT	129
[illegible]	549
[illegible] 12 Port	1,179
Gateway [illegible]	139
HP EtherTwist [illegible] 4 Port	389./449. 2,119
Intellicom 10 Port SNMP Hub	479
Netexpress [illegible] 10 BaseT Hub	99
SMC [illegible]	389
Synoptics [illegible] BaseT	699
Thomas [illegible]	179
TTC 8 Port Internal 10 BaseT Hub	199

CABLING

10 BaseT Cable Assy 1'	10./15
10 BaseT Cable Assy 3'	25./35
10 BaseT Cable Assy 7'	39
10 BaseT Cable Type 1 Plenum	39./79
10 BaseT Cable Type 1	21./39
10 BaseT Cable Type 3 Voice	21./35
10 BaseT Cable Type 3 1000'	289
RJ45 Connector Tool	39
RJ45 Connector	.75¢ ea.
RJ45 Dual Wall Plate Dual	.80

ADAPTERS

ALTA 16 BIT ISA & 10 Base T Combination Adapter

- ALTA 16 1000 Novell Certified Compatible
- 2 LED Indication
- Novell NOVLIM $299
- 5 Year Warranty

$99

3 COM [illegible] TP ea/5+	189./169.
3 COM [illegible] ea/5+	139./119.
3 COM [illegible] TP EISA	259
ACCTON [illegible] 10 BaseT ea/5+	119./89
ALTA 16 bit 10 BaseT ea/5+	89./79
D-LINK PCMCIA Ethernet 10 BaseT	219
D-LINK Pocket Ethernet 10 BaseT	299
Eagle Anthem NE 1000 ea/5+	99./89
Eagle Anthem NE 2 PCMCIA	219
Gateway EtherTwist 16 10 BaseT 32 bit EISA	159
HP EtherTwist 16 10 BaseT ea/5+	109./99
IBM Token 16 10 BaseT Adapter ea/5+	109./99
IBM PC MCA Ethernet 10 BaseT	279
Intel Ethernexpress 16 10 BaseT	115
KODIAK Adapter 10 BaseT	269
SMC Ethercard Elite 16 T Ultra ea/5+	115./107
SMC WD Ethernet + Elite ea/5+	129./119
SMC Elite 16 T/A Microchannel	199
Thomas Conrad PCMCIA 10 BaseT	289
XIRCOM Pocket Ethernet 10 BaseT	299

Whether this is your first experience at networking or you are a certified engineer, the professionals at Network Express are ready to help. Call or FAX us your requirements. • Over 15,000 proven NETWORK PRODUCTS from more than 200 manufacturers.

• Novell, IBM, and Artisoft trained sales consultants to serve you. • This list of products represents a small portion of the selection available. Please call for any networking needs. we'll try to help.

• If you need assistance determining the best way to solve your networking challenges, give us a call, or better yet, take advantage of our 800 FAX number by FAXing us your situation, bid request, diagram, or purchase order. We will provide you with an accurate and timely response.

REPEATERS

TUT SYSTEMS 2 PORT REPEATER $299

3Com Linkbuilder 10 Port Repeater	1,619
3Com 6 Port Fiber Optic Repeater	1,659
Canary BNC / FO Repeater	599
IMC PCNIC Basket PLUS	649
TUT Systems 2 Port Repeater	299
TUT Systems 4 Port Repeater	499
TUT Systems 8 Port Repeater	829

TRANSCEIVERS

AUI to BNC or AUI to RJ45 $69

AUI to BNC Transceiver	69
AUI to 10 BaseT Transceiver	69
Canary BNC / FO Transceiver	599
IMC Fiber Optic Transceiver	219

TEST EQUIPMENT

MT350 Value Kit
Advanced Cable Certification for UTP STP and Coax. Supports Ethernet, Token Ring & ARCNET

$1,979

Accutek 10BT Continuity + Polarity Tester	129
Cable Tester BNC, UHF, N, RCA + more	69
Fluke Lan Test Equipment	CALL
MicroTest Quick Scanner Kit	629.
MicroTest Ring Cable Test Kit	995.
Novell Lanalyzer for Windows	995.
Time Domain Reflectometer	579

PRINT SERVERS

EVERY NOVELL NETWORK WITH A PRINTER DESERVES ONE OF THESE

NETWORK EXPRESS PRINTMATE 3

$399

PRINTMATE JR + PARALLEL CABLE $249

- 2 Parallel Ports
- 1 Serial Port
- BNC AUI & RJ45 Connections
- Simple Installation
- 2 Year Warranty

Castelle Lanpress 2P2S	525.
Castelle Lanpress 2P2S BNC or RJ45	525.
Intel Netport Print Server	439.
Intel Netport Print Server BNC or RJ45	439
Plug In board print server LJ/Ds LJ4 LJ4s	499

NETWORK EXPRESS

AD CODE E14X

1-800-753-9899

24 HOUR TOLL FREE
FAX 1-800-333-5841 FAX
VOICE 1-813-559-2870 • FAX 1-813-555-6841

POWER BACKUP

Smart UPS 600 File-Server Backup Retail $599

$439

BackUPS 250/400/600	109./129./209
BackUPS 600/900/1250	299./419./549
SmartUPS 250/400/600/900	259./329./469./669
SmartUPS 1250/2000	749./1,149
Matrix 3000/5000 VA UPS	2,895./4,449
Powerchute for NetWare	79.
Powerchute for Windows	49.
Interface for Fantastic + Lan Manager	39
Surge Arrest PLUS 7 Outlet	39. with Tel 59.

AMERICAN POWER 220 VOLT

BackUPS 250/400/600i	189./229./299.
BackUPS 900/1250i	489./629
SmartUPS 250/600/900i	279./429./659
SmartUPS 1250/2000i	879./1,379

TRIPP LITE 120 VOLT

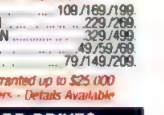
BC 250/400/500	109./169./199.
BC 500 LAN/600 LAN	229./269.
BC 750 LAN/1250 LAN	329./499
Isobar Ultra 4/6/8	49./59./69
LC600/1200/1800	79./149./209.

Equipment Warranted up to $25 000 by Manufacturers - Details Available

SCSI HARD DRIVES

1 Gigabyte SCSI Hard Drive Fujitsu M2694 ESA

$1,099



CONNER

CP30540.	546MB	10ms	659.
CP31370..	1.37GB	10ms	1,179

FUJITSU
5 Year Manufacturer Warranty

M2624FA	520MB	12ms 3.5"	639.
M2266SA	1.1GB	15ms 5.25"	1,295.

Maxtor

Panther P0-12S	1.0GB	13ms	1,049.
MTX 1240S	1.24GB	8.5ms	1,399.

Seagate

ST 11200 N	1 4GB	14 5ms	5.25"	995.
ST 41651 N	1 4GB	14 5ms	5.25"	1,1[illegible]
ST 42100 N	1 4GB	14 5ms	5 25"	1,549.
ST 42400 N	1 4GB	14 5ms	5.25"	1,859
ST 43400 N	1 4GB	14 5ms	5.25"	2,479.

MICROPOLIS

MC 1624HS	668MB	16ms	5.25"HH	779.
MC 2210	1 0GB	10ms	3 25"	1,099
MC 2217	1 7GB	10ms	3 25"	1,399.
MC 1926	2 1GB	13ms	5.25"	1,999.
MC1936	3 0GB	12ms	5.25"	2,649

MICROPOLIS

RAIDION LT

Micropolis Raidion LT 1120 $4,925

RAID ARRAYS

Micropolis Raidion LT 2100	5,950.
Micropolis 6040	13,412.

MICRODISK
Super Capacity External Storage

Microdisk 670	667MB	15ms	1,499
Microdisk 1030	1034MB	14.5ms	1,869
Microdisk 1340	1341MB	14.5ms	1,750.
Microdisk 1750	1749MB	14ms	2,350.
Microdisk 2100	2100MB	11.5ms	2,590
Microdisk 3020	3022MB	12ms	3,050.
Microdisk PC Kit			75
Microdisk Mac Kit			90.

ARCNET PRODUCTS

Arcnet Adapter 8 Bit Star/BUS $59

Active Hub 8 Port	139.
Arcnet Adapter 16 Bit Star/BUS	79.
BNC Connector RG62	3.
CNET 4 Port Passive Hub	29.
D Link Pocket Arcnet	189.
SMC PC130 8 Bit	99.
SMC ArcNet TP Repeater	249.
RG62A/U Cable	30ft.
Thomas Conrad 100 Mbps ISA Adapter	499
Xircom Pocket ArcNet Adapter II	269.

Network Express Policies...
- 30 Day Satisfaction Guaranteed Evaluation Period. Sorry but no refund can be made after 30 days from invoice date. Products must be in new condition with all manuals boxes and received materials. Opened software packages not returnable. RMA required.
- Full Manufacturer's Warranty on all products.
- Same Day Shipping & Overnight Delivery available on most orders. Government, Education, and Corporate Purchase Orders welcomed, subject to approval.
- APO/FPO Orders Welcome + Shipping Charges Not Refundable + We Export.
- Prices, Specifications & Availability subject to change without notice.

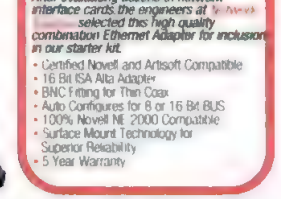
$349 IT'S YOUR CHOICE!
January Lollapuza • Bonus Lan
High Performance 2 Station Starter Kit With Your Choice of Software

NETWORKING BREAKTHROUGH!
COMPLETE 2 STATION 10MBS ETHERNET STARTER KIT INCLUDES:
- 2 – Copies of Artisoft LANtastic, or Novell Lite
- 2 – 16 BIT Alta Ethernet Adapters
- 2 – 50 OHM Cable Terminators
- 1 – 25' Length of Cable (Longer lengths available)
- Additional Users – $169 (includes adapter card & software)

MAKE THE DIFFERENCE! START YOUR AREA NETWORK TODAY!

THE RIGHT CHOICE
After evaluating dozens of network interface cards, the engineers at Network Express selected this high quality combination Ethernet Adapter for inclusion in our starter kit.
- Certified Novell and Artisoft Compatible
- 16 Bit ISA Alta Adapter
- BNC Fitting for Thin Coax
- Auto Configures for 8 or 16 Bit BUS
- 100% Novell NE 2000 Compatible
- Surface Mount Technology for Superior Reliability
- 5 Year Warranty

ETHERNET COAX



Ethercard Elite 16C Ultra QTY 6+ $119 $109

ADAPTERS

3COM 3C507 Etherlink 16 BNC ea/5+	319./279.
3COM 3C503 Etherlink II BNC ea/5+	179./159.
3COM 3C509 Etherlink III ea/5+	129./119
3COM 3C579 EISA 32 Bit	259
Artisoft NodeRunner SI Adapter BNC ea/6+	109/99.
Alta BNC/RJ45 16 Bit 4 LED	99
Eagle/Anthem NE2000 PLUS BNC ea/5+	115./99.
IBM Ethernet BNC Adapter	CALL
Intel Ether Express 16 BNC	115
Kodak Noteport BNC + 10BT	269
NE 2000 Compatible-Certified	79.
NE PE300B Pocket Ethernet BNC ea/3+	199/169.
SMC Ethercard + Elite 16 BNC ea/6+	129/119
SMC Ethercard + Elite 16 Qty 6+	119.
SMC Elite/a Coax Micro Channel	199
SMC EISA Dual Port BNC	679
Xircom Pocket Adapter BNC	299.

CABLING

BNC Crimp Style Connectors	3.00
BNC Dual Wall Plate	7.[illegible]
BNC Twist-On Connectors	3.75
BNC T Connectors	4.00
BNC 52 Ohm Terminators	3.00
BNC 52 Ohm Terminators-Grounding	10.
BNC Crimping Tool	29.
Ethernet Thinnet Coaxial Cable 25' Assy	15
Ethernet Thinnet Coaxial Cable 50' Assy	25.
Ethernet Thinnet Coaxial Cable 100' Assy	35.
Ethernet Thinnet Coaxial Cable 500' Assy	129
Ethernet Thinnet Coaxial Cable 1000' Assy	199.
RG58 A/U Coax Cable	30¢ ft.
RG58 A/U Coax Cable Plenum Jacket	50¢ ft.

REPEATERS-HUBS

3Com Linkbuilder 10 Part BNC Repeater	1,619
Canary BNC to Fiber Optic Repeater	599
TUT Systems Quad Port Repeater	499.
TUT Systems Dual Port Repeater	299.

TOKEN RING

SMC TOKEN RING CARD ELITE ISA/MCA $279

ADAPTERS

3COM TokenLink III 16/4 ISA/MCA	439./475.
Accton Pocket Token Ring	439.
Accton Ring Adapter MCA 16/4	379.
IBM 4 MBS Token Ring	295.
IBM 16/4 Token Ring ISA/MCA	549
Olicom 16/4 Token Adpt ISA/MCA	349./369.
PROTEON 16/4 Token Ring Adpt ISA/MCA	439./439.
PROTEON FISA BusMaster 16/4	499.
SMC Tokencard Elite ISA /MCA	279.
Thomas Conrad 16/4 ISA /MCA	379./439.

MAU

Accton RingHub 300 8 Port MAU	329.
C NET 8 Port Token Ring MAU Type 1	369.
C NET 8 Port Token Ring MAU Type 3	309
IBM 8228 MAU Multi Access Unit	469.
Olicom 8 Port UP T MAU	369.
SMC Token Ring Elite MAU 8 Port	439.
SMC Token Ring Elite MAU 16 Port	609.
Thomas Conrad Token Ring RJ45 MAU	695.

Novell, Netware, and "N" are trademarks of Novell. All other brand names are trademarks of their respective companies. Small people read the fine print and they do business with Network Express! © 1994 NETWORK EXPRESS DIVISION MOCL INC.

Discover, VISA, MasterCard, Diners Club, American Express, Carte Blanche Accepted. Never A Surcharge.

Business Hours (EST) M-F 8:30am 6pm Sat 1pm
Network Express 1811 Kingsley Ave Orange, CA 92867

CIRCLE 878 ON READER SERVICE CARD

MIDWEST COMPUTER WORKS

WELCOME

YOUR MAIL ORDER SUPERSTORE !

NETWORKING **HARDWARE**

Get the ...

Best PRICES, SERVICE & SELECTION!!!

You are our top priority. If you're not happy, we're not happy. That's why we have taken a vow to provide you with the best prices, service and selection possible. If you don't see your product listed call us, we'll get it! If our prices aren't the lowest, we'll beat it!

- ***Widest Selection*** Choose from a huge inventory of thousands of items, all in-stock and ready for immediate shipment.
- ***Knowledgeable Sales Staff*** All of our personnel are technically trained to provide you with the right solutions.
- ***On-Time Delivery*** All in-stock orders are shipped the same day. We're fast and efficient.
- ***Just ask our Customers*** We earn your business everyday. That's why over 70% of our business is repeat customers.
- ***Quality Products*** All of our products are name brands and factory fresh, providing the highest quality possible.
- ***Comprehensive Tech Support*** We just don't sell you, we service you ! Our technicians are standing by to help with any problems that might arise.

Fast Shipping, no problem ! We deliver when you need it.

Worldwide Air Freight Services — DHL — UPS — NEXT DAY AIR 2ND DAY AIR.

We make it easy with flexible payment methods!

- Purchase orders accepted from educational institutions, federal & state agencies and approved corporations.
- All major credit cards accepted.
- C.O.D's welcome.

Policy Information

• Your credit card is not charged until the merchandise is shipped • Personal and company checks will delay orders 2-weeks • No extra charge for credit cards • All prices subject to change • For orders outside the USA we require payment by wire transfer or American Express credit card • We check for stolen credit cards • All returns for credit, repair or exchange must have a return authorization number issued by our customer service department • All returned merchandise must be shipped to our main warehouse located at 180 Lexington Drive, Buffalo Grove, IL 60089

ORDER DEPARTMENT 1-800-859-6757

FAX Line 1-708-459-6933

International line 1-708-459-6884

Customer Service 1-708-459-9410

Technical Support 1-708-459-9411

NETWORKING

3COM 3C503 Etherlink II 16-bit coax	159
3COM 3C503TP Etherlink II 16-bit 10baseT	179
3COM 3C509 Etherlink III coax	129
3COM 3C509 Etherlink III coax 5-pack	519
3COM 3C509TP Etherlink III 10baseT	119
3COM 3C509TP Etherlink III 10baseT 5-pack	525
[illegible]	[illegible]
3COM 3C529 Etherlink III PS/2 coax	237
3COM 3C529TP Etherlink III PS/2 10baseT	237
3COM 3C579 Etherlink III EISA coax	229
[illegible]	229
3COM 3C16271 12-Port Link Builder 10BaseT	618
Artisoft Central Station 2	389
Artisoft Noderunner 2000/C Coax	175
Artisoft Noderunner 2000/T 10BT	175
Artisoft Noderunner/SI 2000/T 10BT	99
Artisoft AE-2 Ethernet 10BT card	189
Artisoft AE-2 Ethernet 16-bit coax card	184
Artisoft AE-3 Ethernet Combo card	222
Artisoft AE-2 V5.0 Starter kit for DOS	443
Artisoft AE-2 V5.0 Starter kit for Windows	519
Artisoft AI 6-user / 12-user / 500-user	CALL
Artisoft Peer Hub internal 10base-T	285

DigiBoard High Speed Communication Adapters

Tired of your operating system bottlenecking by the limited performance of standard COM1 and COM2 serial ports combined with the CPU resources required to manage serial I/O traffic? DigiBoard sets the standard for high-speed Windows communications and remote LAN access.

Digiboard ALL MODELS	CALL
IBM Token Ring adapter II	289
IBM Token Ring adapter II 16/4	498
Intel Ether Express 16-bit coax	99
Intel Ether Express EISA 32-bit coax	397
Intel Token Express 16/4 ISA	399
Netware 2.2 5-user/10-user	469/998
Netware 3.12 5-user	549
Netware 3.12 10-user	1249
Netware 3.12 25-user	1749
Netware 3.12 50-user	2465
Netware 3.12 100-user	3499
Netware 3.12 250-user	6799
Netware SFT III 3.11 BEST PRICE	CALL
[illegible]	[illegible]
Netware V4.01 25-user CDROM	2989
[illegible]	3925
[illegible]	5589
Netware V4.01 250-user CDROM	9987
Netware V4.01 500-user CDROM	CALL
Netware V4.01 1000-user CDROM	CALL
Netware 3.12 on CDROM or diskette	CALL
Netware Upgrades Available	BEST PRICE
Netware Lite software	69
Netware Lite Starter kit NE2000	339
NE1000 Ethernet 8-bit coax	87
NE2000+ Ethernet 16-bit coax	109
SMC Arcnet PC130/PC270E	68/108
SMC Arcnet PC600WS workstation	119
SMC Arcnet PC600FS server	198
SMC Arcnet 8-port Coax Active Hub	225
[illegible]	94
[illegible]	119
[illegible]	119
SMC Ethernet 8-port 10BaseT Concentrator	329
SMC Ethernet 12-port 10BaseT Concentrator	599
[illegible]	105
[illegible]	105
[illegible]	123
[illegible]	184
[illegible]	142
[illegible]	599
[illegible]	599
[illegible]	66
Thomas Conrad 6245 Arcnet 16-bit	176
Thomas Conrad 3045 STP 100 mbps	448
Thomas Conrad 3045-CX 100mbps coax	448
Thomas Conrad 3045ST 100mbps fiber	704
Thomas Conrad 3047 CX 100mbps EISA	599
Thomas Conrad 3050 STP 8-port Hub	1199
[illegible]	115
[illegible]	99
[illegible]	236
Xircom Pocket Arcnet twisted pair	234
[illegible]	289
[illegible]	289
Xircom Pocket Token Ring Adapter	526
Xircom Pocket Ethernet Print Server coax	299
[illegible]	289
Xircom Parallel Port Multiplexor	78
[illegible]	269

VIDEO BOARDS

ATI VGA Integra 1024x768 512k	69
ATI VGA Wonder GT 1MB	163
ATI Graphics Ultra+ 2MB ISA	235
ATI Graphics Ultra Pro 2MB ISA	389
ATI Graphics Ultra Pro 2MB EISA	374
ATI Ultra Pro VLB 2MB	349
Boca Super-X 2MB ISA / VESA	129/169
Boca Vortex VRAM 2MB	289
Diamond Speedstar Pro 1MB	115
Diamond Stealth Pro 1MB/2MB	239/339
Diamond Stealth Pro Local Bus 1MB/2MB	255/339
Diamond Viper Local Bus 1280X1024nl	409
Hercules Dynamite Pro ISA or VLB 1MB	159
Hercules Graphite Pro 1MB / 2MB	249/389
Matrox MGA-Ultra 2MB ISA	819
Matrox MGA-Ultra 2MB VESA	849
Number Nine GXE VLB Level 11 / 12	359/429
Number Nine GXi TC Level 29	1449

DIGITIZERS

Calcomp 12x12 / 12x18 all w/16 button	279/558
Kurta 12x12 XLP / 12x18 XLP	229/469
Summasketch III 12x12 / 12x18 Pro	299/529

PLOTTERS

Calcomp Pacesetter 2024	2999
Hewlett Packard Plotters	ALL MODELS
Houston Instruments DMP52 C/D 1-pen	1999
Houston Instruments DMP61 A/D 1-pen	2074
Pacific Data Pro Tracer II	1349
Roland DXY-1150 A/B 8-pen magnetic	859
Roland DXY-1250 A/B 8-pen electrostatic	1059

COLORADO MEMORY SYSTEMS INC. Jumbo 250 Internal Tape Backup System

America's number 1 selling tape drive. It's affordable with a backup speed of 9.3MB per minute. Includes powerful Colorado Backup software. Holds up to 250MB using data compression. For IBM and PC compatibles. Model DJ-20 **$167.00**

TAPE BACKUP

Colorado DJ-10 120MB / DJ-20 250MB	109/167
Colorado Trakker 120MB 250MB	279/339
Colorado PT-25 2GB SCSI w/controller int	949
Conner Tapestor 250MB int/ext	159/329
Maynard Maynstream 2.0gig DAT int	1929
Maynard Maynstream 4.0gig DAT int	2389
Mountain FS8600 305MB int IDE	449

MICROTEK ScanMaker II XE

This high speed 8.5"x13.5" flatbed scanner boasts 1200 x 1200 dpi resolution, 24-bit color 8-bit grey scale and 1-bit b&w scanning. Included is interface, 24-bit video card and Adobe Photoshop software. All this for only **$1099.00**

SCANNERS

Epson 800C Color / 800C Color	779/1088
Hewlett Packard Scanjet 2P greyscale	723
Hewlett Packard Scanjet 2CX Color	989
Logitech Scanman 256	169
Microtek Scanmaker II color	629
Microtek Scanmaker II XE color w/Aldus sft	989
Mustek Color Hand Scanner 400dpi w/sftwr	239

MODEMS

Boca Pocket Modem 14.4 w/Fax	179
Boca Modem 14.4 v.42bis w/Fax int	179
Boca Modem 14.4 v.42bis ext	189
Hayes Acura 144+ FAX/SCEZ int	199
Hayes Optima 14.4 + FAX14.4 EZ ext	399
Intel Satisfaction 100 / 200	98/283
Intel Satisfaction 300i / 400e	229/387
Megahertz modems for all laptops	CALL
Multitech 1432MU 14.4 fax/modem pocket	379
Multitech 1432BA 14.4 fax/modem ext	425
Practical Periph 2400EFX w/Fax & sftwr int	99
Practical Periph PM1440FX Pocket	369
Practical Periph 14,400 send/rec fax ext	219
Supra 14.4 S/R Fax int/ext	139/199
Supra Fax Modem 14.4LC ext	159
Telebit QBlazer v.32 v.42 v.42bis transport	296
UDS internal & external ALL MODELS	CALL
US Robotics Sportster 2400 w/fax ext	119
US Robotics Sportster 14.4 int/ext	159/179
US Robotics Sportster 14.4 w/fax int/ext	175/199
US Robotics Courier HST Dual Standard int	679
US Robotics Worldport pocket modems	CALL
Zoom AFC 2400 v.42 w/Fax int	59
Zoom FC9624 send/rec Fax int w/software	69
Zoom VXV32BIS 14.4 v32/32bis 42bis ext	186

NANAO F550i-W

Along with the standard features of the F550i, the F550i-W has an auto power conservation mode and a new anti-reflective coating. Advanced image control adjusts a multitude of picture controls and contours. On sale for only **$1179**

MONITORS

Amdek mono VGA 14"	129
CTX 14" 1024X768 .28mm	249
CTX 14" 1024x768 nl .28mm	289
CTX 15" 1024x768 nl .28mm	385
CTX 15" 1024x768 nl .28 digital	378
CTX 17" 1024x768 nl .28 digital	899
Goldstar 1423+ 14" 640x480 .51mm	189
Goldstar 1460+ 14" 1024x768 .28mm	249
Goldstar 1710 17" 1024x768 .31mm	699
Idek MF5117 17" 1024x768	839
Idek MF5217 17" 1024x768 .26mm	889
MAG MX15F 15" 1280x1024 .28mm	594
MAG MX17F 17" 1280x1024 .26mm	898
Mitsubishi Diamond Scan 17" 1280x1024	969
Mitsubishi Diamond Scan 20" 1024x768	1549
Nanao F340i 15" 1024x768 .28mm	699
Nanao F550i 17" 1280x1024 .28mm	998
Nanao F550i-W 17" 1280x1024 .28mm	1179
Nanao T560i 17" 1280x1024 .28mm	1089
Nanao T660i 20" 1280x1024 .31mm	2459
NEC 3FGE 15" 1024x768 .28mm	579
NEC 4FGE 15" 1024x768 .28mm	689
NEC 5FGE 17" 1280x1024 .28mm	1049
NEC 5FG 17" 1280x1024 .28mm	1245
NEC 6FG 21" 1600x1200 .28mm	2249
Panasonic C-1381i 14" 1024x768	329
Philips 15" 1024x768 nl .28mm	469
Philips 17" 1600x1200 nl	1145
Sony CPD1430 14" 1024x768 .25mm	526
Sony CPD1730 17" 1024x768 .25mm	989
Sony GDM-17SE1 17" 1600x1280 nl	CALL
Sony GDM-2036S 20" 1280x1024 .30mm	2019
ViewSonic V15 15" 1280x1024 .28mm	459
ViewSonic V7 17" 1280x1024 nl .28mm	828
Zenith 1790 17" 1024x768 nl	1049

MATH CO-PROCESSORS

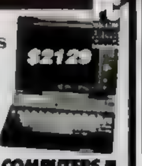
Cyrix 80387SX-16/20/25	68
Cyrix 80387DX 16/20/25/33	65
Intel 486SX 16/20 to 40 Overdrive	289
Intel 486SX & 486DX 25 to 50 Overdrive	349
Intel 486SX & 486DX 33 to 66 Overdrive	519
Intel 80387SL / 80387SX 16/20/25	75/75
Intel 80387DX-20/25/33	79
Weitek ALL MODELS	CALL

BATTERY BACKUPS

American Power BK250B 250VA	87
American Power BK400B 400VA	157
American Power BK450 450VA	189
American Power BK600 600VA	298
American Power BK900 900VA	399
American Power BK1250 1250VA	489
American Power AP400 SmartUPS	289
American Power AP600 SmartUPS	349
American Power AP900 SmartUPS	542
American Power AP900XL SmartUPS	1049
American Power AP1250 SmartUPS	699
American Power AP2000 SmartUPS	1129
American Power SurgeArrest	17
American Power SurgeArrest Plus	38
American Power SurgeArrest Plus w/Tel	49
American Power Line-R 600	114
American Power Line-R 1250	158
Tripp Lite BC250	98
Tripp Lite BC400	149
Tripp Lite BC500	179
Tripp Lite BC500 LAN	189
Tripp Lite BC600 LAN	245
Tripp Lite BC750 LAN	299
Tripp Lite BC900 LAN	349
Tripp Lite BC1250 LAN	449
Tripp Lite Omni 500 LAN	259
Tripp Lite Omni 600 LAN	299
Tripp Lite Omni 750 LAN	369
Tripp Lite Omni 1250 LAN	599
Tripp Lite ISO BAR 4 / ISO BAR 6	44/63
Tripp Lite Command Console 6	69
Tripp Lite Command Console 6 w/RJ11	79
Tripp Lite LC1200 / LC1800	143/187

MICE

Logitech Dexxa 3-button serial	[illegible]
Trackman II Combo	[illegible]
Logitech Kidz mouse w/software	[illegible]
Logitech Mouseman	[illegible]
Logitech Trackman Portable	[illegible]
Microsoft bus or serial 400 dpi	[illegible]
Microsoft Ballpoint mouse	109
Microsoft Ballpoint mouse w/Windows 3.1	149



TEXAS INSTRUMENTS TM4000E WinSX/25 Color **$2129**

- Intel 486SX 25MHz 4MB RAM Max-20MB
- 120MB hard drive
- 8.2" bright passive color display

NOTEBOOK COMPUTERS

AST Bravo NB486SX25 170MB Mono	1889
AST Bravo NB486SX25 170MB STN Color	2559
AST Bravo NB486SX25 170MB Active Clr	3339
AST PowerExec 486SL25 200MB	CALL
AST PowerExec 486SL25 200MB Color	CALL
Canon NoteJet 486/25MHz 85MB	2129
Canon NoteJet 486/25MHz 135MB	2339
Canon NoteJet 486/25MHz 180MB	2539
Compaq Contura 4/25 120MB	1929
Compaq Contura 4/25 209MB	2219
Compaq Contura 4/25C 120MB Color	2619
Compaq Contura 4/25C 209MB Color	2899
Compaq LTE-LITE 25E 84MB Windows	2459
Compaq LTE-LITE 4/25 Color 120MB Win	CALL
Texas Instr 486/25WinSX 120MB	1845
Texas Instr 486/25WinSX 120MB Color	2129
Texas Instr 486/25WinDX 120MB	1998
Texas Instr 486DX/25 200MB	2199
Texas Instr 486DX2/50 120MB	2569
Texas Instr 486DX2/50 200MB	2699
Texas Instr 486DX2/50 200MB Color	3798
Texas Instr 486DX2/40, 200MB Color	2948
Texas Instr 486DX2/50 455MB Mono	CALL
Texas Instr 486DX2/50 455MB Active Clr	CALL
Toshiba T1900 486SX-20 120MB	1499
Toshiba T1900C 486SX-20 120MB Color	2119
Toshiba T4600 486SL-33 120MB	2459
Toshiba T4600C 486SL-33 200MB Color	4099

TEXAS INSTRUMENTS TM4000E DX2/50

- 486DX2 50MHz 4MB RAM Max. 20 MB-RAM
- 200MB hard drive
- 8.4" VGA Active clr display

$3798

COMPUTERS

AST Bravo 486DX/33 120MB w monitor	1649
AST Premium SE 486DX/33 8MB no-HD	2699
AST Premmia 486DX2/66 340MB 8MB	3369
Compaq Prolinea 4/25S 120MB	1119
Compaq Prolinea 4/25S 240MB	1319
Compaq Prolinea 486/33 120MB	1499
Compaq Prolinea 486/50 240MB	1969
Compaq Prolinea 4/66D 340MB	2289
Compaq Deskpro 483/33i model 120W	1849
Compaq Prosignia 486DX2/66 model EL/1	3079
DTK Computer...custom configurations	CALL
Wyse Terminals 30+/50/60/325ES	279/355/279/539

DRIVES

Conner CP30084E 84MB 17ms IDE	169
Conner CP30104H 120MB 17ms IDE	179
[illegible]	189
Conner CP30254 251MB 14ms IDE	302
Conner CP30344 343MB 13ms IDE	339
[illegible]	479
Iomega Transportable Pro 90 ext	475
Iomega Multidisk 150 PC Powered Ext	499
[illegible]	179
[illegible]	216
Maxtor 7345A 340MB 15ms IDE	299
Micropolis 2205 584MB 10ms SCSI-2	729
Micropolis 2210 1.05GB 10ms SCSI-2	959
Micropolis 2217 1.7GB 10ms SCSI-2	1279
Quantum Pro-127AT 127MB 17ms IDE	189
Quantum Pro-240AT 240MB 16ms IDE	245
Seagate ST3144A 130MB 16ms IDE	169
Seagate ST3243A 214MB 16ms IDE	219
Seagate ST3290A 260MB 16ms IDE	239
Seagate ST3390A 341MB 12ms IDE	299
Seagate ST3550A 452MB 12ms IDE	439
Seagate ST3655A 545MB 12ms IDE	569
SyDos 88i 88MB internal removable	379
SyDos 88E 88MB external removable	449
SyDos Puma 88MB ext/parallel removable	439
Teac FD505 dual floppy drive	119
Teac 3.5" and 5.25" disk drives	59
Toshiba 3.5" 1.44MB disk drive	59

CONTROLLERS

Adaptec AHA-1522A SCSI-2 ISA Kit w/Flop	139
Adaptec AHA-1542 SCSI-2 ISA w/Flop	199
Adaptec AHA-2742 SCSI-2 EISA w/Flop	299
Adaptec AHA-2842 SCSI-2 VESA w/Flop	299
Boca IDE 2-HDD, 2-FDD	35
Boca IDE 2-HDD, 2-FDD 2-ser, 1-par	49
Ultrastor 24F EISA SCSI	396
Ultrastor 34F VESA Local Bus SCSI-2	289

Call "THE WORKS" Today

TO THE WORKS!

A Commitment to Selection, Quality Service & Lowest Pricing

MULTIMEDIA · PRINTERS · SOFTWARE

THOUSANDS OF TITLES IN-STOCK! CALL FOR BEST PRICES!

MULTIMEDIA

- Creative Labs Digital Edge int ... 669
- Creative Labs Discovery 8 int ... 369
- Creative Labs Discovery 8 ext ... 439
- Creative Labs Discovery 16 int ... 439
- Creative Labs Discovery 16 ext ... 509

CREATIVE
CREATIVE LABS, INC

EDUTAINMENT CD 8 & 16

Includes everything you need to turn your everyday computer into a multimedia entertainment center! System includes: SoundBlaster 8/16, MIDI interface, joystick port, stereo amplifier and mixer, stereo speakers, and high-quality CD-ROM drive.

- Creative Labs Edutainment 8 ext 509
- Creative Labs Edutainment16 int 509
- Creative Labs Edutainment16 ext 579
- MediaVision Fusion CD16 int ... 409
- MediaVision Fusion CD16 ext ... 429
- MediaVision Fusion Double CD16 int. 515
- MediaVision Fusion Double CD16 ext 579
- MediaVision Pro16 Multimedia sys 699
- MediaVision Pro16 Multimedia II ... 799
- MediaVision CDPCXL Subsys ... 1129
- Texel Home Bundle w/8 CDs ... 465
- Texel External Drive/Kit ... 679
- Texel Multimedia Bundle int. ... 769
- Turtle Beach Multisound upgrd ... 1249

VIDEO CAPTURE

- Cardinal SnapPlus ... 639
- Creative Labs Video Blaster ... 329
- Creative Labs Video Spigot ... 332
- Hauppauge Win/TV-01 no/tuner 369
- Hauppauge Win/TV-02 w/tuner 419
- Hauppauge Win/TV-02V ... 499
- MediaVision ProMovie Spectrum 279
- TrueVision Video VGA8 ... 679
- TrueVision Video VGA16 ... 799
- TrueVision Targa+ 16 ... 1227
- TrueVision Targa+ 64 ... 1699
- Visionx Desktop TV ... 243
- Willow VGA TV 4000 ... 369
- Willow Laptop TV ... 739

CD-ROM DRIVES

- Creative Labs Omni CD int ... 299
- Hitachi CDR6700 ... 369
- NEC CDR-74-1 external ... 395
- NEC CDR-400 portable 3XP ... 439
- NEC CDR-500 internal 3XI ... 479
- NEC CDR-600 external 3XE ... 569
- Sony CDU-31A int drive ... 179
- Sony CDU-561 295ms int ... 369
- Sony CDU7811 295ms ext ... 519
- Texel 265ms bare drive ... 389
- Toshiba TXM-3401-B int ... 479
- Toshiba TXM-3401-E1 ext ... 539

CD-ROM SOFTWARE

- Coral Draw 4.0 ... 349
- Kings Quest VI ... 45
- Leisure Suit Larry 5 ... 39
- Microsoft Office V4.0 ... 469
- Microsoft Office Pro ... 609
- Microsoft Dinosaurs ... 49
- Microsoft Golf V1.0 ... 45
- NEC Type Gallery ... 235
- Virgin 7th Guest ... 49

OPTICAL DRIVES

- Panasonic LF5014 WORM ... 2049
- Panasonic LF3004 3.5"128mb ... 889
- Panasonic LF7014A 1616 5.25" int. . 2419
- Pinnacle Tahoe-130PC 128MB . 1119
- Pinnacle PMO130AT 3.5"130mb 1719
- Pinnacle PMO650 5.25" 650mb 3079
- PLI Infinity Floptical 3.5" 21mb int 369
- PLI Infinity 3.5" 128mb int ... 1249
- Sony 3.5" 128mb rewrite ext .. 1299
- Sony 5.25" 650MB rewrite int. 1929
- Sony 5.25" 650mb rewrite ext 2219
- Valuator Super 21MB Floptical ext. .. 399
- Valuator Super 21MB Floptical port. . 429

SOUND BOARDS

- ATI Stereo F/X-CD ... 145
- Logitech SoundMan 16 ... 109
- MediaVision Audio Port ... 119
- MediaVision Pro Audio Spectrum 16 Basic 135
- MediaVision ProAudio Studio16 ... 209
- Sound Blaster Deluxe ... 79
- Sound Blaster Pro Deluxe ... 119
- Sound Blaster 16 ASP ... 219
- Turtle Beach Multisound ... 406
- Turtle Beach Multi-bundle ... 669

PC SPEAKERS

- Altec Lansing ACS100 Pair ... 125
- Altec Lansing ACS200 Pair ... 199
- Altec Lansing ACS300 System 275
- Creative Labs CT-38 ... 25
- Sony Powered Speakers ... CALL

CANON

- BJ10EX ... 239
- BJ200 / BJ230 ... 259*/389
- BJC-600 ... 585
- BJC800 / BJC820 ... 1469/1596
- LBP430 / LBP8SX ... 589/889

CITIZEN

- PN48Pro ... 259

COMPAQ

- Pagemarq 15 ... 2599
- Pagemarq 20 ... 3749

DICONIX

- Kodak 180si ... 229
- Kodak Color Ease Dye Transfer . 6459

EPSON

- FX870 / FX1170 ... 259/344
- LQ570+ / LQ870 ... 235/424
- LQ1070 / LQ1170 ... 348/589
- LQ2550 / EPL8000 ... 879/829
- DFX5000 / DFX8000 ... 1299/2199
- Action 1000 / Action 1500 599/649
- Action 2250 / Action 3250 115/174
- Stylus800 ... 289***

HEWLETT PACKARD

- HP Portable ... 395
- Deskjet 310 ... 316
- Deskjet 500 / 500C ... 309/399
- Deskjet 550C ... 574
- Deskjet 1200C ... 1379
- Laserjet IIIP ... 639
- Laserjet 4L / 4P ... 674/969
- Laserjet 4 ... 1369
- Laserjet 4M ... 1999
- Laserjet 4Si ... 2979
- Laserjet 4SiMX ... 4479
- Paintjet XL300 ... 2259

HP ACCESSORIES

- Paper Cass trays ... IN-STOCK
- Pacific Data memory ... CALL
- Toner for all models ... CALL

IBM

- Execjet II 4076 ... 289
- Jetprinter PS4079 ... 2579
- Laser 5E ... 659
- Laser 10 / Laser 10R ... 1119/1349
- Lsr. 10R Duplex / Lsr.12R 1649/1699
- Laser 12L / Laser 16L ... 2449/2729

NEC

- P3200 / P3300 ... 225/322
- Jetmate 1000 ... 289
- P6200 / P6300 ... 399/599
- Superscript 610 ... 639
- LC95F / LC97 ... 879/1063

OKIDATA

OL400e This 300x300 DPI laser printer grows as your needs grow! With high speed RISC processor, 17 bitmapped fonts, 512K upgradable to 2.5MB of RAM, 100 page bottom paper feeder, and a print speed of 4 pages per minute! Introductory offer! ... $499

OKIDATA

- 184 Turbo ... 215
- 320 / 321 ... 299/419
- 520 / 521 ... 369/489
- 590+ / 591+ ... 419/569
- 395 / 395c ... 959/1029
- Laser 400E / 810 ... 499/899
- Pacemark 3410 ... 1199

PANASONIC

- KXP2180 / KXP2023 ... 169/199
- KXP2123 / KXP1124I ... 228/249
- KXP2124 / KXP1624 ... 295/328
- KXP1654 / KXP2624 ... 518/364
- KXP4410 / KXP4430 Laser 549/678
- KXP4440 / KXP4450I Lsr 1169/929
- KXP4451 Lsr/4455 Pstscrpt 1349/1679
- KXP5410 Postscript Laser ... NEW

QMS

- 410 / 420 Postscript ... 1539/1799
- 860 Hammerhead ... 3969
- 860+ Hammerhead ... 5349
- Colorscript 210 / 230 ... 4499/7199
- Colorscript 1000 Clr Lsr ... In-Stock
- PS1725 ... 4469

SEIKO

- Smart Label Printer+ DOS/Win 139
- Smart Label Printer Pro ... 228
- CH-4104PSE Color Pstscrpt . 2449

STAR

- NX1040R / NX2430 ... 159/229
- Starjet 48+ ... 285

TEXAS INSTR

- MicroMarc inkjet 300cps ... 289
- MicroWriter Basic 5ppm ... 519
- MicroWriter PS23 5ppm ... 699
- MicroWriter PS65 5ppm ... 929
- MicroLaser Pro PS23 8ppm 600dpi ... 1329**
- MicroLaser Pro PS65 8ppm 600dpi ... 1619

** W/$80 rebate
*** W/$50 rebate thru 10/31/93

WIN SOFTWARE

- ACT! V1.0 for Windows ... 249
- Adobe Type Font Sets ... CALL
- Adobe Illustrator 4.0 ... 419
- Adobe Photoshop 2.5 ... 529
- Aldus Freehand 3.1 ... 369
- Aldus Pagemaker 5.0 ... 549
- Borland C++ 3.1 ... 329
- Borland Turbo C++ 3.1 ... 75
- Borland Office for Windows ... 399
- Borland Objectvision 2.1 ... 99
- Borland Paradox for Win V4.5 . 139
- Borland Quattro Pro V5.0 ... 47
- CA-dBfast ... 174
- CA-Realizer ... 71
- CA-Simply Accounting ... 65
- Caere Omnipage Direct ... 179
- Caere Omnipage Pro 2.1 ... 599
- Calera WordScan Plus 2.0 ... 399
- Central Point Anti-Virus 1.4 ... 86
- Central Point Backup 7.2 ... 85
- Central Point PCTools Win ... 119
- Coral Draw 4.0 ... 375
- Corel SCSI Software ... 65
- Corel SCSI Pro V2.0 ... 317
- Delrina Perform Pro + 1.0 ... 235
- Delrina Winfax Pro 3.0 ... 77
- Harvard Draw 1.0 ... 169
- Harvard Graphics 2.0 ... 255
- Lotus 1-2-3 ver 4.01 ... 299
- Lotus Ami Pro 3.01 ... 235
- Lotus Freelance 2.0 ... 339
- Lotus SmartSuite 2.1 ... 439
- Micrografx Charisma 2.1 ... 319
- Micrografx Designer 4.0 ... 445
- Micrografx Picture Publisher 4.0 .. 399
- Microsoft Excel 4.0 ... 285
- Microsoft FoxPro 2.5 ... 290
- Microsoft Office 4.0 ... 459
- Microsoft Powerpoint 3.0 ... 299
- Microsoft Project 3.0 ... 429
- Microsoft Publisher V2.0 ... 67
- Microsoft Win. NT Adv. Serv. .. 949
- Microsoft Win. NT V3.1 ... 290
- Microsoft Word 2.0 ... 299
- Norton Backup 3.0 ... 95
- Norton Desktop 2.2 ... 113
- PFS: Window Works 2.0 ... 44
- Presentation Task Force 4.0 ... 119
- Procomm Plus 1.02 ... 95
- Professional Write Plus ... 159
- Publisher's Paintbrush 2.0 ... 299
- Quark Express v3.1 ... 549
- Quicken 3.0 ... 39
- Superbase 4 2.0 ... 329
- Word Perfect 6.0 ... 296

DOS SOFTWARE

- ACT! 2.1 for DOS ... 248
- CA-BPI Integrated ... 147
- CA-Clipper V5.2 Upgrade ... 139
- CA-Simply Accounting ... 65
- Borland Appleuse II 1.5 ... 399
- Borland dBase IV 2.0 ... 519
- Borland Framework IV 1.0 ... 469
- Borland Multimate 4.0 ... 239
- Borland Paradox 4.5 ... 519
- Borland Quattro Pro 5.0 ... 49
- Central Point Anti-Virus 1.0 ... 85
- Central Point Backup 8.0 ... 88
- Central Point PC Pro 9.0 ... 88
- DAC Easy Accounting 4.4 ... 69
- DAC Easy Bonus 4.4 ... 145
- Design CAD 3D 4.0 ... 225
- Generic CADD 6.1 ... 265
- Harvard Graphics 3.0 ... 390

UPGRADE to AIR FREIGHT*

- Lotus 1-2-3 2.4 ... 325
- Lotus 1-2-3 3.4 ... 399
- Lotus Symphony V3.0 ... 465
- Microsoft C/C++ Compiler 7.0 . 300
- Microsoft Foxbase Plus 2.10 ... 239
- Microsoft FoxPro 2.5 ... 299
- Microsoft Project 4.0 ... 299
- Multimate 4.0 ... 239
- Norton Backup 2.2 ... 94
- Norton Desktop 1.0 ... 113
- Norton Utilities 7.0 ... 112
- PC Anywhere 4.5 Host/Rem ... 114
- Peachtree Complete V7.0 ... 175
- Procomm Plus 2.01 ... 69
- Professional File 2.0 ... 169
- Professional Write 2.2 ... 159
- Q & A 4.0 ... 245
- QuickBook with QuickPay ... 115
- Quicken 7.0 ... 41
- R:Base 4.5 ... 459
- Stacker 3.1 ... 69
- Timeslips 5.0 ... 179
- Word Perfect Add'l License ... 159
- Word Perfect 6.0 ... 299
- Word Perfect Office ... 89
- Wordstar 7.0 ... 259
- Xtree Gold 3.0 ... 91

* On software orders over $100 and under 20 lbs.

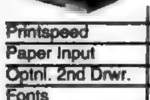
MATCH OF THE CENTURY!

IBM vs. HP

	4039-10R	Laserjet 4
Printspeed	10ppm	8ppm
PostScript	YES	(Optional)
Resolution	600DPI	600DPI
Upgradable Language	YES	NO
Available Duplex Option	YES	NO
MCW Price	$1349	$1368

And the Winner is The 4039-10R from IBM!

IBM vs. HP

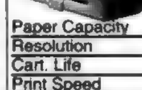


	4037-5E	Laserjet 4L
Printspeed	5ppm	4ppm
Paper Input	150 Sht.	100 Sht.
Optnl. 2nd Drwr.	YES	NO
Fonts	40	26
MCW Price	$659	$674

And the Winner is The 4037-5E from IBM!

IBM LEXMARK

IBM vs. HP



	Execjet II 4076	Deskjet 500
Paper Capacity	150 Sht.	100 Sht
Resolution	600x300	300x300
Cart. Life	1000 pgs.	500 pgs.
Print Speed	300 cps	240 cps
Res. Enhncmnt.	YES	NO
MCW Price	$289	$309

And the Winner is The Execjet from IBM!

GREAT PRINTER DEALS!

NEW Canon PRINTERS!!!

BJC-600 Bubble Jet Color Printer

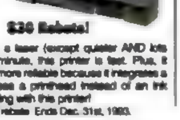
- 360 dpi resolution
- 170 cps at 10 cpi; 340 cps at 20 cpi
- 100 sheet feeder
- Ltr, Lgl Commercial #10

$585

The Canon BJC-600 is the brilliant choice in a personal color printer. That's because it can produce vibrant, high resolution color and laser-quality, true black output on low-cost plain paper. This makes the BJC-600 both an effective and efficient color printer for the home or small office.

BJ-200 Bubble Jet Printer

- 360 dpi resolution
- 173 cps - LQ mode
- 100 sheet feeder
- 8-1/2"x14" paper size



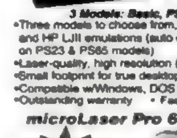
$259†† **$30 Rebate!**

InkJet printer that acts like a laser (except quieter AND lots cheaper)! At 4 pages-per-minute, this printer is fast. Plus, it requires less service and is more reliable because it integrates a straight paper path and uses a printhead instead of an ink cartridge. You can't beat going with this printer!

†† Price includes $30 rebate. Ends Dec. 31st, 1993.

TEXAS INSTRUMENTS
SPECIALS • SPECIALS • SPECIALS • SPECIALS

microWriter Page Printers



From $519

3 Models: Basic, PS23, PS65

- Three models to choose from, including PostScript and HP LJII emulations (auto emulation switching on PS23 & PS65 models)
- Laser-quality, high resolution (300 dpi) printing
- Small footprint for true desktop use
- Compatible w/Windows, DOS & MAC
- Outstanding warranty • Fast 5ppm print speed

microLaser Pro 600 Printers

$1329† PS23

2 Models: PS23, PS65

- Razor-sharp 600 dpi printing
- 500-sheet standard paper capacity
- Compatible w/Windows, DOS & MAC
- Easy to replace, long lasting consumables
- Fast 8 ppm print speed w/RISC processor
- Built-in PostScript Level 2 software from Adobe & PCL 5 language (auto emulation on PS23 & PS65 models)

† With $80 rebate from Texas Instruments. Ends Dec. 31st 1993

MIDWEST COMPUTER WORKS
180 Lexington Drive, Buffalo Grove, IL. 60089

DIRECT ORDER LINE **1-800-85-WORKS**
(1-800-859-6757)

FAX 1-708-459-6933
Customer Service 1-708-459-9410
CIRCLE 010 ON READER SERVICE CARD

BULLDOG COMPUTER PRODUCTS RECEIVED PC COMPUTING'S ★★★★ MAIL ORDER AWARD!!!

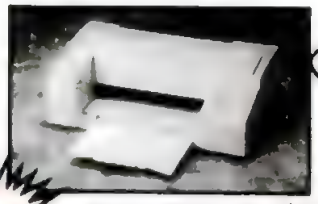
CALL 1-800-438-6039

Canon

NOTEJET 486 - SLC/25

- 486 SLC/25 Mhz
- Built-In "Bubble-Jet" printer
- 4 MG Ram

85 MG - $2139 • 135 MG - $2349
180 MG - $2549



Byte Magazine "Best Buy!"

Epson Stylus 800—$279

Network

3COM
- 3C503/5-pack 179/789
- 3C503TP 10 Base T 219
- 3C507 Etherlink 16 279
- 3C523 MCA Ethernet 279
- 3C619 449
- 3C509-Etherlink 3 119
- 3C509-5 Pack 529

ARTISOFT
- Starter Kit 2mbps/AE2 ..... 325/429
- Lan Cards 2mbps/AE2 ..... 129/185
- Central Station 385
- Lantastic Noderunners ..... NEW!
- 2000/C Starter Kit 429
- 2000/C add on Kit 169

CALL FOR OTHER LANTASTIC PRICES!

INTEL
- Ether Express 16/16TP 89
- Ether 16-20 Pack 1639
- Token Express 16/4 ISA/MCA ... 479
- EtherExpress EISA 449

NOVELL
- NE1000/NE2000 ..... 99/119
- NE3200 659
- Novell Lite 1.1/starter kit 69/409
- Netware 2.2 5/10 User 479/1059
- Netware 3.12 5/10 User 579/1299
- Netware 3.12-25 User 1729
- Netware 3.12-50 User 2279
- Netware 3.12-100 User 3249
- Netware 4.0-5/10 User 859/1959
- Netware 4.0-25 User 2899
- Netware 4.0-50 User 3890
- Netware 4.0-100 User 5475
- Netware 4.0-250 User 9799

SMC
- PC130/PC130E 75/99
- PC600WS/PC600FS 129/199
- Ethercard 8 bit/16 bit 89/119
- 10 Base-T Card 8 bit/16 bit ... 99/119
- 3608TP 108T concentrator 325
- 3512TP Ether.10BT conc. 12 port 579

XIRCOM
- Pocket Ethernet PE3-10B 269
- Pocket Ethernet PE3-10BT 269
- Parallel Port Multiplexor 79

Software

- Aldus Pagemaker 5.0 509
- Carbon Copy/Close Up 129/119
- Clarion ProDeveloper 299
- Clipper 5.2 ..... Call
- Corel Draw 4.0 359
- Dbase IV V.2.0 409
- FoxPro 2.5 299
- Framemaker 549
- Freelance Plus 4.0 299
- Harvard Graphics 359
- Lotus 2.4/3.1+ 275/339
- NEW! Lotus 3.4 349
- Lotus for Windows 299
- Smart Suite Bundle 399
- MS DOS 6.0 ..... In Stock
- Microsoft Windows 3.1 79
- Microsoft Windows N/T 929
- Microsoft Windows for Workgroup . Call
- Microsoft Access 1.0 for Windows . Call
- Microsoft Excel 4.0 for Windows ... 299
- Microsoft Bookshelf - CD 129
- Microsoft Office 449
- Microsoft Word for Windows 289
- Norton Desktop for Windows 119
- Norton Utilities 7.0 105
- Peachtree III Complete DQ 179
- Paradox v4.0 ..... Best Price!
- Q&A 4.0 199
- Ventura Desktop Pub ..... Best Price!
- Winfax Pro 89
- Word Perfect 6.0 249
- Word Perfect for Windows 268
- Word Perfect 6.0 Upgrade ..... Call

Notebooks

CANON
- 486 SLC/25, 120 mg 1575
- 486 SLC/25, 120 mg-color 2199
- Notejet 486 w/printer-85mg 2139
- Notejet 486 w/printer-135 mg ... 2349
- Notejet 486 w/printer-180 mg ... 2549

EPSON
- 486 DX2/120 mg 1619

TEXAS INSTRUMENTS
- 4000 SX25 W/120 1835
- 4000 DX2/50 W/200 2639
- 4000 DX2/40 Color W/200 2889
- 4000 DX2/50E Active Color 3749

Monitors

NEC MULTISYNC
- 3FGE/3V 579/499
- 4FGE 679
- 5FG/5FGE 1245/1049
- 5FGP 1339
- 6FG/6FG 2249/2299

CTX
- 1560 15" SVGA 379
- 5468/1451 ..... 249/279
- 1760 17" SVGA 719

MAG
- MX15F 15" .28 495
- MX17F 17" .28 879

NANAO
- NEW! F550iW 1159
- F550i/T560i 995/1675
- NEW! F340iW 689

VIEW SONIC
- 15/17-7 ..... 429/799
- 20/21 ..... 1679/1879

Video Cards

ATI
- Graphics Ultra+2 mg 219
- Graphics Ultra Prof w/2 mg 329

BOCA
- Basic VGA 47
- Super VGA 1 mg 109

Modems & Fax

BOCA
- 14.4 Fax Modem Int/Ext 129/149

CARDINAL
- 2400 Int/Ext 42/65
- 14.4 Int/Ext 169/179

HAYES
- Optima 96 319
- Optima 14.4 Ext/Fax 369
- 14.4 fax modem Int/Ext 189/199
- Accura 2400B Int/Ext 59/75

INTEL
- 14.4/14.4 Fax Int/Ext 149/169
- PC MCIA 24/96 179
- PC MCIA 14.4/14.4 279
- Satisfaction 300 14.4/9600 Fax ... 219
- Satisfaction 400/400E 259/295

PRACTICAL PERIPHERALS
- PP 14400 Fax Int 185
- PM 14400 FXMT ext v.32 bis 195
- PM 14400 FXPPM Pocket Mod ... 319
- PP 9600 Int/Ext 159/179

US ROBOTICS
- Sportster 14.4 Int 145
- Sportster 14.4 Fax/Int 149
- Sportster 14.4 Fax/Ext 169
- Courier HST Dual 16.8 659
- PCMCIA 14.4 295

Printers

CANON
- BJ10ex 239
- BJ200-After $30[00] Rebate 255
- BJ230 389
- BJC600 579
- BJC800 1449
- LBP-430 579

EPSON
- LX810 169
- AP 2250 119
- AP 3250 169
- FX870 259
- FX1170 345
- LQ570 235
- LQ870 425
- LQ1070+ ... 355
- LQ1170 589
- LQ2550 879
- DFX5000 .. 1299
- DFX8000 .. 2189
- Action Laser 1000 579
- Action Laser 1500 639
- Stylus 300 Inkjet 239
- Stylus 800 Inkjet 279

HEWLETT-PACKARD
- Laserjet IV w/toner 1369
- Laserjet IVM w/toner 1929
- Laserjet IVL 675
- Laserjet IVP 969
- Laserjet IVMP 1379
- Laserjet IVML 1039
- HP IVsi 2989
- Deskjet 500/500c 309/409
- Deskjet 550c 575
- HP Deskjet 1200c 1369
- HP Deskjet 1200c/ps 1939

LASER ACCESSORIES
- Upgrade for HP I mb 79
- Upgrade HP 2mb/4mb 99/159
- Jet Direct 2371A 399
- Pacific Data 25-N-I 239
- Pacific Page PE/PEXL 259/699

OKIDATA
- ML184/380 ..... 229/209
- ML320/321 ..... 295/415
- ML520/521 ..... 369/489
- ML590/591 ..... 419/569
- 395/395c 959/1029
- Laser 400E/810 ..... 495/899
- Laser 410E-600 DPI 699
- 830I/850 ..... 1069/1199
- PM3410 1199

NEC
- Jetmate 1000 269
- P6300 599

PANASONIC
- 2023/1124i 199/229
- 1624/1654 ..... 379/519
- 2180/2123 ..... 169/229
- 2124/1695 ..... 295/369
- 2624 24 pin wide 369
- 4410 laser/4430 ..... 535/639
- 4440/4455 ..... 1149/1659

Mice & Misc.

- Epson Action Scanning 779
- Microsoft Mouse w/Windows 3.1 ... 139
- Logitech 256 w/OmniPage 185
- Logitech Color Scanner 439
- HP Scanjet IIP w/interface 719
- HP Scanjet IIC w/interface 979
- Summasketch 12×12 255

AMERICAN POWER
- Back-ups 250/400/450 ..... 99/159/189
- Back-ups 600/900 ..... 259/369

Bulldog Systems

Dual Floppy Drives • Super VGA w/1 Mg • 14" SVGA Monitor - .28 • DOS 6.0 • Windows • Mouse • • Local Bus
1 year warranty!

- 386SX-40 w/2MB w/80 Mg 999
- 486SX-25 w/4MB w/170 Mg 1299
- 486SLC-66 w/4MB w/245 Mg 1499
- 486DX-2-66 Loc Bus,8 MB,340 Mg 2199

Call for other configurations

CANON INNOVA SYSTEMS
- 486SX-20 w/4MB w/120 Mg 1239
- 486DX-50 w/4MB w/240 Mg 1649
- 486DX-66 w/4MB w/245 Mg 1899

Canon systems include dual floppys, Super VGA Monitor, Fax Modem, Mouse, D.O.S., Windows, Works, Vesa Local Bus

Drives

CONNER
- 120 mg/175 mg 179/199
- 212 mg/540 mg 239/649

IOMEGA
- NEW! Bernouli Multidisk
- Transportable 150 559
- Insider 150 499
- Tape 250 mg Insider 199
- Tape 250 mg. ext. 319
- 21MB Floptical Insider 349

MAXTOR
- 7131A 131 IDE 175
- 7213A 210 IDE 199
- 7245A 245 IDE 235

SEAGATE
- ST3144A 179
- ST3283A 245 mg IDE 279
- ST3290A 260MG 225
- ST3550A 452MG 409

FLOPPY DRIVES
- 1.2MB/1 44 MB 59
- Micro Solutions 1.2MB/1.44 MB . 159
- Teac Dual Floppy Drives 119

Tape Drives

CONNOR — 250 149

COLORADO MEMORY SYSTEMS
- DJ10 120 Meg Int Jumbo 119
- DJ20 250 Meg Int Jumbo 165
- Trakker 120 275
- Trakker 250 315
- 2120 Formatted Tape 21

MICRO SOLUTIONS
- 80/250 Backpack 349

CD Rom

Triple Speed Drives

NEC
- 3Xe/3Xi 549/459
- 3XP/4X Pro 429/899

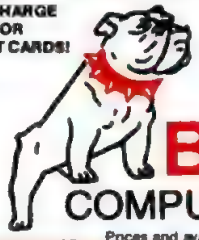
PANASONIC
- CD, Sound, Titles 349

Chips

- 1 mg/4 mg Simms 49/159
- HP 4mg/8 mg 159/339

INTEL
- 387 SX or DX 85
- Overdrive SX20/25 ..... 285/339
- Overdrive DX25/33 ..... 339/495

NO CHARGE FOR CREDIT CARDS!



3241 E. Washington Rd.
Martinez, GA 30907
Open weekdays: 8:30 a.m. to 8:30 p.m.
Saturday: 9:00 a.m. to 5:00 p.m.
(706) 860-7364 — (706) 860-7358
Shipping (706) 228-6368

BULLDOG COMPUTER PRODUCTS

Prices and availability subject to change without notice.

CIRCLE 015 ON READER SERVICE CARD

GLOBAL HORIZONS

GLOBAL SERVICE CENTRE
Knowledge is everything. In order to help you make a more informed buying decision, The Global Service Centre now offers FAXBACK service featuring specification sheets on each of our advertised products.
Call 1-800-57-SERVE
GET THE FAX!

IT'S HARD TO BEAT OUR DRIVE!

CONNOR			
CP30124	IDE	124MB	168
CP30254	IDE	250MB	228
CP30544	IDE	540MB	499
CP30540	SCSI	540MB	499
CP31370	**SCSI**	**1.37G**	**1025**
FUJITSU			
2624	SCSI	540MB	569
2694	SCSI	1.0G	969
2654	**SCSI**	**2.0G**	**1669**
SEAGATE			
ST251 1	MFM	40MB	179
ST3144A	IDE	130MB	CALL
ST3290	**IDE**	**260MB**	**223**
ST3390	IDE	330MB	294
ST3550A	IDE	452MB	399
ST3550N	SCSI	457MB	529
ST41200	SCSI	1.0G	979
MAXTOR			
7131A	IDE	130MB	CALL
7245A	IDE	260MB	225
7345A	**IDE**	**340MB**	**289**
540A	IDE	540MB	675
540S	SCSI	540MB	675
1240S	SCSI	1.2G	1189
MICROPOLIS			
2206A	IDE	528MB	699
2205	SCSI	560MB	699
2210A	**IDE**	**1.0G**	**919**
2210	SCSI	1.0G	919
2217	SCSI	1.7G	1269
1528	SCSI	1.2G	975
1926	SCSI	2.0G	1789
1936	SCSI	3.0G	2169
WESTERN DIGITAL			
2250	**IDE**	**250MB**	**229**
2340	IDE	340MB	325
2420	IDE	420MB	359
QUANTUM			
ELS127S	**SCSI**	**120MB**	**185**
LPS240A	IDE	240MB	242
LPS240S	SCSI	240MB	242
LPS525S	SCSI	525MB	575
FLOPPY DRIVES			
SONY 3 1/2" 1.44MB			49
TEAC 3 1/2" 1.44MB			49
TEAC 3 1/2" 2.88MB			**89**
TEAC 5 1/4" 1.2MB			55
TEAC Dual Floppy Drive			115

SCSI CONTROLLERS

Adaptec 1510A CD Rom	89
Adaptec 1522A w/Floppy	99
Adaptec 1522A Kit	135
Adaptec 1542CF Busmaster	**192**
Adaptec 1542CF Kit	245
Adaptec 1542+ Kit	303
Adaptec 1640 MCA	269
Adaptec 2740 EISA	**279**
Adaptec 2742 EISA Kit	359
Adaptec 2840 Local Bus	269
Adaptec 2842 Local Bus Kit	295
Adaptec EZ-SCSI Software	59
Future Domain 7000 EISA	365
Ultrastor 12C IDE Caching	**379**
Ultrastor 14F Busmaster	229
Ultrastor 24F EISA	395
Ultrastor 34F Local Bus	285

IDE CONTROLLERS

16 Bit Controller Kit w/Multi I/O	39
BOCA 16 Bit Controller	39
DFI IDE w/Multi I/O & 16550 UART	69
DFI VLB-IDE w/Multi I/O	89
PROMISE TECH 16 Bit SA 512K Cache	149
PROMISE TECH VLB Caching Controller OK	**149**

TAPE DRIVES

ARCHIVE Viper 525MB SCSI Int	499
ARCHIVE Python 2GB SCSI Int	**1199**
COLORADO DJ10	105
COLORADO DJ20	165
COLORADO J110/J120	275/315
COLORADO PowerTape 2-4G	945
CONNER TapeStor DC2000 250MB	**189**
CONNER TapeStor DAT 2G Int	1099
MAYNARD MAYNSTREAM DAT 2.0G Int	**1599**
MICRO SOLUTIONS BACKPACK 250 MB parallel port	349
MOUNTAIN FS8500 300MB IDE Int	437

All Drives Are **New** & **In-Stock** • Dedicated Tech Support (708) 949-9371

Guaranteed Lowest Prices!!

NOTEBOOKS

AST Bravo NB 4/25 120 HD Mono/Color	1765/2429
CANON Notejet 4/25 85 HD	2299
COMPAQ Concerto 4/25 120/250 HD	2379/2679
COMPAQ Concerto 4/33 250 HD	2949
COMPAQ Contura 4/25C 120/209	IN STOCK
COMPAQ LTE/Lite 4/25C 120/209	3949/4249
TI TM4000 Win SX/DX 25 120 HD	1799/1989
TI TM4000E SX/25 120 HD Adv Color	2089
TI TM4000 DX2/40 200 HD Color	2899
T.I. TM4000E Win DX2/50 200 HD Mono	**2639**
TI TM4000E Win DX2/50 200 HD Dual Color	NEW
T.I. TM4000E DX2/50 200 HD Active Color	**3699**
TOSHIBA T1900 SX20 120 HD Mono/Color	1529/2139
TOSHIBA T1950CS DX2/40 120/200 HD Color	**2499/2749**
TOSHIBA T1950CT DX2/40 120 HD Active Color	2859
TOSHIBA T4600 4/33 120 HD Mono/Active	2499/3899
TOSHIBA T4700CT DX2/50 320HD Active Color	4939

NOTEBOOK SPECIAL
T.I. TM4000E DX2/50 COLOR MONITOR
TEXAS INSTRUMENTS **$3699**
- Super Fast 486DX2 50MHz
- Brilliant Active Color Display
- Simultaneous Display
- 4MB RAM & 200MB HD
- Excellent T.I. Service & Support

SOUND CARDS & SPEAKERS

ADVANCED GRAVIS Ultrasound	125
ALTEC LANSING Speakers ..... *ALL MODELS*	**CALL**
CREATIVE LABS Soundblaster 16 MCD w/ASP	159/189
CREATIVE LABS Soundblaster 16 SCSI w/ASP	178/208
CREATIVE LABS Soundblaster Deluxe	75
DIAMOND Sonic Sound	215
LABTECH Speakers *ALL MODELS*	CALL
MEDIA MAGIC ISP16/DSP16+ SCSI	**99/239**
MEDIAVISION Pro Audio Spectrum 16	159
MEDIAVISION Pro Audio Studio 16/XL	**198/317**
MICROSOFT Sound System	174
TURTLE BEACH Multisound	495

GH VISION SYSTEMS
GH386 SX/33 105/129/210 GH486 DX/33 130/170/210
GH486 SX/25 130/170/240 GH486 DX/50 170/210/340
GH486 DX/33 $1349
- 486DX/33 MHz
- 14" SVGA Monitor
- 4 MB Ram
- Mini Tower Chassis
- 250 MB IDE HD
- DOS 6.0/Win 3.1

MODEMS

ATI 2400 ETC Int/Ext	69/95
BOCA 14.4 w/FAX Int/Ext	**129/159**
CARDINAL 2400 Int/Ext	41/75
INTEL SatisFAXtion 100/300/400 Int	98/235/279
MEGAHERTZ Modems For Notebooks	**ALL MODELS**
PRAGMA PERIPHERALS Pocket 14.4 w/FAX	338
PRAGMA PERIPHERALS 14.4 w/FAX Int	182
PRAGMA PERIPHERALS 14.4 w/FAX Mini Tower	208
SUPRA 24/96 w/FAX Int	51
SUPRA 14.4 w/FAX Int	**139**
TELEBIT QBlazer Portable	295
US ROBOTICS Worldport 24/96 w/FAX Port	219
US ROBOTICS Sportster 96 w/Fax Int/Ext	159/169
US ROBOTICS Sportster 14.4 w/Fax Int/Ext	158/178

BATTERY BACK-UPS

AMERICAN POWER	
Back UPS 250 400/450/600	98/155/185/255
Smart UPS 400/600/900/900XL	**275/335/525/1089**
Surge Arrest 7	18
TRIPPLITE	
BC 250 400/500	95/149/177
BC LAN 500/600/1250	185/245/445
Omni 450/600/900	248/292/464
Command Console Compact	**49**
Lappower-AC to 12 Volt Adapter	65

CD ROM & MULTIMEDIA

CREATIVE LABS Discovery CD 8/16 Bit	365/435
CREATIVE LABS Edutainment CD 8/16-bit	459/505
CREATIVE LABS Omni CD/Digital Edge	289/625
MEDIAVISION Fusion CD 16 Int/Ext/Double	**388/388/499**
MEDIAVISION Memphis ..... *NEW*	**729**
MEDIAVISION Pro 16 Multimedia System VII	689/779
MEDIAVISION Pro 16 CD Int w/Pro Studio	669
MITSUMI Double Speed CD ROM w/Kit	**229**
NEC CDR 74-1 Ext/84-1 Int CD Rom	399/419
NEC 3XI/3XE Triple Spin CD Rom	465/555
TEAC Double Speed CD Rom	**349**
TEXEL Double Speed CD Rom Int/Ext	299/399
TEXEL Home Bundle External	**479**
TEXEL Business Bundle Int/Ext	669/759
TOSHIBA XM3401 Int/Ext	**389/499**

BUNDLE UP!!!
WITH THESE SIX TOP SELLING MPC CD'S FOR THE SPECIAL PRICE OF **$99**
- U.S. ATLAS
- WORLD ATLAS
- CHESSMASTER 3000
- SAN DIEGO ZOO PRESENTS THE ANIMALS
- MAVIS BEACON TYPING
- GROLIER'S MINI ENCYCLOPEDIA

CD SOFTWARE SELL-EBRATION
- Adventures of Willy Beamish
- Addition Mammals
- Barron's College Guide
- Battle Chess
- Business Phone Book
- Carmen San Diego
- Chess Maniac
- Chessmaster 3000 MPC
- Complete Shakespeare
- Cookbook Heaven
- Crossword Construct
- Dictionary of The Living World
- Discovery Adventures
- Family Doctor
- Fast Hunter II
- Gunship II
- Great Cities of The World
- Guinness Disc 1000 MPC
- Jones in The Fast Lane
- King's Quest V
- Loom
- Mantis Fighter
- Where Is Monty
- Where Dinosaur Type
- Where Clinic
- Monkey Island
- National Parks
- Video Out Goodies
- Our Solar System
- Playing with Language
- Roger Wilco
- Star Trek Deep Space Nine MPC
- Shareware Games
- Sherlock Holmes Vol 1 & 2
- Space Shuttle
- Star Wars Chess
- Stellar 7
- Time Table of History
- Total Baseball
- US and World Atlas
- Variety Show
- Wing Commander Ultima
- BBS STUFF
- Arthur's Teacher Trouble
- Gomez Bear Goes to School
- Gomez Bear Goes to Space
- Jasper and the Beast
- Multimedia Family Choice
- Interactive Storybook
- Lets Play
- Wood Up Mother Goose
- Peter and the Wolf
- Sleeping Beauty
- Digital Heaven
- Family Education Collection
- Blackbirds Kids Dictionary MPC
- Where Is Monty/World Atlas Deal
- Sesame Street Gold Vault Collection
- Sports Illustrated Almanac
- Trademarks Reference Library
- 20th Century Video Almanac
- Library of the Future
- Microsoft MIDI Beethoven
- Roger Ebert's Movie Companion
- Virgin Games 7th Guest

Call Today For Our Guide To CD ROM Software

MONITORS

AOC SVGA 14" 17"	285/799
CTX S439-14"/1561 15"	218/369
CTX PROSCAN 1760LR 17"	**669**
HITACHI 15"/20"	469/1329
MAG MX15F MPRII 15"	499
MAG 17F 17"/21"	**938/NEW**
MAGNOVOX CM 9039/9089	259/319
MITSUBISHI 17"/20"	1015/1589
MONOCHROME MONITORS Amber or White	95
NANAO F550I ..... *NEW LOW PRICE*	**1029**
NANAO F340IW/F550IW	**688/1139**
NANAO F560IW/F760IW	1429/2089
NANAO T560I/T660I	1668/2399
NEC MONITORS *NEW MODELS*	IN STOCK
SAMTRON 14" VGA/SGVA	208/291
SAMTRON SC726V 17"	799
SEIKO CM1450/1760	**417/939**
SONY CPD1430/1730	595/1029
SONY 17SF 17"	1209
VIEWSONIC V6/V7 SVGA 17"	360/819
VIEWSONIC 17/21	**989/1949**

IN A HURRY?
UPGRADE TO FEDERAL EXPRESS AIR SHIPPING FOR JUST **$3.00**
($3.00 AIR OFFER GOOD ON ALL CD-ROM TITLES AND HARD DRIVES)

NETWORK

NOVELL Netware Lite/ w/16 Bit Eth card	**69/139**
NOVELL Netware v3.12 5/10/25 User	569/1259/1689
NOVELL Netware v3.12 50/100 User	2289/3499
NOVELL Netware v4.01 5/10/25 User	849/1949/2889
CALL US FOR YOUR NETWARE UPGRADES	
ARTISOFT AE2 AE3 Cards	193/219
ARTISOFT Lantastic 5.0 AE2 Starter Kit	457
ARTISOFT Nodemunner	157
BOCA 18 Bit Ethernet Card Coax/TP Combo	**79/99**
INTEL EtherExpress 16/16TP	**94/94**
INTEL EtherExpress 16 5 Pack	459
INTEL EtherExpress EISA 32 bit	389
SMC Ethercard+ Elite 16 16TP	114/114
SMC Ethercard+ Elite 8 Pack	**564**
3COM Ethernlink III 5 Pack	515
3COM Etherlink III Coax/TP	**119/119**
THOMAS CONRAD TC6242/TC6245	65/175
THOMAS CONRAD 100mbps TCNS 16 Bit	432
XIRCOM Pocket LAN Adaptors	**CALL**

SOFTWARE

MICROSOFT DOS 6.2 Upgrade	49
ALDUS Pagemaker 5.0	572
CALERA Omnipage Direct	**249**
COREL Draw 4	385
INTUIT Quicken 2.0 for Windows	39
LOTUS 123 For Windows	289
MICROSOFT Access for Windows	**299**
MICROSOFT Excel v4.0	299
MICROSOFT Office for Windows	445
SYMANTEC PC Anywhere v4.5	113
SYMANTEC Norton Utilities	115
WORDPERFECT v 6.0 DOS OR WIN	279

WE STOCK UPGRADES FOR MOST SOFTWARE
CALL TODAY
1000'S MORE TITLES AVAILABLE
★ CHECK OUT OUR CD ROM SOFTWARE SELECTION ★

VIDEO BOARDS

ATI Basic 16 VGA	59
ATI Graphic Ultra Plus 1MB/2MB	208/227
ATI Graphic Ultra Pro 1MB/2MB	327/348
BOCA SuperVGA 512K	69
CARDINAL VGA 110+/800	55/129
DIAMOND Stealth 24 ISA/VLB	154/154
DIAMOND Stealth Pro/Viper VLB 2MB	**329/384**
HERCULES Graphite 210	218
HERCULES Dynamite VL for DOS	**159**
NUMBER 9 GXE Level 10,11,12,14	235/347/427/649
NUMBER 9 GXI TC Level 29	**1349**

SCANNERS & MICE

HEWLETT PACKARD Scanjet 2P	**720**
HEWLETT PACKARD Scanjet 2CX	949
LOGITECH Scanman 256 w/Autostitch	159
LOGITECH Scanman 32 w/Catchword OCR	**129**
MICROTEK Scanmaker II/IIXE	869/1095
Master Color Artist Pro w/OCR handheld	349
DEXXA 3 Button Serial Mouse	**23**
LOGITECH Mouseman/Cordless II	69/95
MICROSOFT Serial Ballpoint	72/108
IDENTITY Serial Mouse w/pad & pocket	29

PRINTERS

HEWLETT PACKARD – *IN STOCK*	
LaserJet 4/4M/4P	**1385/1919/975**
LaserJet 4L/4ML/4MP	679/1009/1369
LaserJet 4SI/4SI MX	**2969/4419**
DeskJet 500/500C/550C	307/396/589
DeskJet Portable 310	395 NEW
DeskJet 1200C/Postscript	1389/1949
Paintjet XL300	2205
Fax 200/310	989/1229
TEXAS INSTRUMENTS	
MicroMarc/MicroWriter PS23/PS65	279*/669*/935*
MicroLaser Pro 600 PS23/PS65	**1325*/1525***
*After Manufacturers Rebate	
CANON	
BJ10EX	239
BJ200/230/600/820	255*/364*/589/1577
*After Manufacturers Rebate	
NEC LASERS ..... *ALL MODELS*	**CALL**
OKIDATA	
ML 320/321/590+/591+	298/419/419/567
Ok Laser 400E/830+/850	509/1099/1245
PANASONIC	
KXP 2180/2023/2123/2124	169/209/239/323
KXP 1124/1624/2624/1654	259/345/389/539
KXP 4410/4430/4440/4450	599/669/1239/959

We also carry a **HUGE** inventory of the full line of printers from
EPSON • CITIZEN • QMS • SEIKO
KODAK • OKIMATE • STAR MICRONICS
Call for our low price today! We have what you're looking for!

WE OFFER YOU
- QUALITY PRODUCTS
- HUGE INVENTORY
- KNOWLEDGEABLE SALES STAFF
- RELIABLE SERVICE
- FAST DELIVERY
- EXPERIENCED TECHNICAL STAFF

CTX MONITOR SPECIAL
CTX MONITOR SPECIAL
PRO SCAN 1760 LR
- 17" Square, Flat Screen
- Sharp .28MM Dot Pitch
- Microprocessor Control
- MPRII Low Emission
- Front Panel Controls
- High Resolution 1280 x 1024NI

$669.99

International Orders Welcome

1-800-860-GLOBE
(1-800-860-4562)

FAXBACK SERVICE
(708) 949-9372
Send Your Fax Today!
All Quotes Answered IMMEDIATELY!

Women Owned Business

Global Horizons, Inc.

1051 E. High Street ◻ P.O. Box 644 ◻ Mundelein, IL 60060
HOURS CST: 7:00 a.m.-7:00 p.m.– Monday-Friday • 8:00 a.m.-2:00 p.m. –Saturday

HUGE INVENTORY– WE HAVE WHAT YOU'RE LOOKING FOR!! Most orders ship within 24 hours. We accept VISA, Master Card, Discover, Wire Transfers and C.O.D.'s. Terms available – Immediate credit approval. Credit cards not charged until products ship. Prices and availability subject to change without notice.

CALL TODAY FOR OUR "SPOTLIGHT ON SAVINGS" CATALOG!!

Outside Illinois 1-800-860-4562
Inside Illinois (708) 949-9332
Shipping & Technical Assistance (708) 949-9369
CIRCLE 277 ON READER SERVICE CARD

Welcome To The Jungle

SIMM MODULES

30 PIN SIMMs

1x3 - 70	$ 49
1x9 - 70	$ 69
4x9 - 70	$179
16x9 - 70	$850

72 PIN SIMMs

(1 mb)	256 x 36	$ 59
(2 mb)	512 x 36	$109
(4 mb)	1 x 36	$209
(8 mb)	2 x 36	$429
(16 mb)	4 x 36	$799

EXPANSION BOARDS

Acculogic™

RAMpAT Plus™ $109
2-16 mb Expansion Board for 286 and 386 IBM-compatible machines

Simmply Ram/16™ . $145
1-32 mb Expansion Board for P/2 models 50 and 60

Simmply Ram/32™ . $145
1-64 mb Expansion Board for P/2 models 70 and 80

EISA Ram™ $189
1-128 mb Expansion Board for EISA Bus systems

Memory Direct Is Your Natural Selection for Quality Computer Components & Memory.

Superior Service

Tech Support You Can Count On

Finest Quality Fully Tested Product

LAPTOP & NOTEBOOK MEMORY

AST

Premium Exec 286, 386SX/20, 25, 25C	4mb	$239
Power Exec 4/25 SL	4mb	$239
Power Exec 3/25SL, 3/25SL-C, EL	4mb	$ 239
	8mb	$ 649
	16mb	$1279

COMPAQ

Contura 3/20, 3/25, 3/25C	4mb	$239
	8mb	$469
Contura 4/25 Series	4mb	$249
	8mb	$469
LTE 286	2mb	$149
	4mb	$259
LTE 386s/20	4mb	$259
LTE Lite 20, 25, 25c, 25e	4mb	$259
	8mb	$639
	16mb	$1069
LTE 4/25c	4mb	$269
	8mb	$499
SLT 286	4mb	$249
SLT 386s/20	4mb	$239

IBM

ThinkPad	2mb	$139
	8mb	$559
PS/2 Cl57SX, ThinkPad 700, 700c	4mb	$299
	8mb	$559
PS/2 N51 SCL, SX	2mb	$129
	4mb	$259
	8mb	$469
L40SX PS/Note 182, N33SX	2mb	$129
	4mb	$259
	8mb	$469

MEMORY • MEMORY

AST

Bravo 386 SX, WS/286, 386	2mb	$ 109
	4mb	$ 219
Bravo 3/25s	2mb	$ 159
	8mb	$ 479
Bravo 3/33s	2mb	$ 149
	8mb	$ 439
Bravo LC/25s, 4/33, 4/33s, 4/50d, 4/66d	4mb	$ 229
	16mb	$ 869
	32mb	$1739
Premium 386/25, 33, 33T, Premium II 386 SX/16, 20, 25	1mb	$ 69
Bravo 4/33, 486/25,	2mb	$ 139
Premium 4/25, 33TE,	4mb	$ 239
Power Premium 3/33, 4/33, 4/33s, 4/50d, 4/66d, Premium 386 33TE, 486/25, 25e, 25TE, 33, 33e, 33TE, Premium II 3/25, 33, 486/33, 486SX/20 & Server SE 4/33	8mb	$ 489

IBM

PS/1 286, 386SX	2mb	$ 119
	4mb	$ 229
PS/1 Consultant, Essential, Expert & Personal System/Valuepoint	4mb	$ 319
	16mb	$ 979
PS/2 25/286, 30/286	2mb kit	$ 159
PS/2 50Z, 55SX, LS, 70, 35SX, LS, 90SX	1mb	$ 69
	2mb	$ 129
PS/2 35SX, LS, 40SX, 55SX, LS, 65SX, LS, X Station, PS/Valuepoint Cxx Series	4mb	$ 239

IBM CONT'D

PS/2 35SX, LS, 40SX, PS/Valuepoint Cxx Series	8mb	$ 519
PS/2 90 XP, 95 XP, P75 (pairs), 56, 57, PS/1 Pro 2123	2mb	$ 129
PS/2 90, 95 XP, P75, 56, 57, PS1 Consultant, Essential, Expert x11, x13, x14, PS1 Pro 2123, RS/6000	4mb	$ 259
	8mb	$ 519
PS/2 model 50 & 60 Series	1-32mb exp. brd	$ 145
PS/2 model 70 & 80 & 90 Series	1-64mb exp. brd	$ 145

COMPAQ

DeskPro 386-20, 20e & 25	4mb	$ 279
DeskPro 386s/16	4mb	$ 279
DeskPro 286N, 386N, I Series, 386SX/20, SystemPro LT Series	1mb	$ 69
	2mb	$ 119
	4mb	$ 269
	8mb	$ 529
DeskPro 386-33, 486-33 & System Pro	2mb	$ 159
	8mb	$ 529
ProLinea 3/25s, 3/25zs	2mb	$ 159
	8mb	$ 489
ProLinea 4/25s, 4/33, 4/50	1mb	$ 69
	2mb	$ 129
	4mb	$ 259
	8mb	$ 519

LASER PRINTER MEMORY

Hewlett Packard Laser Jet IIIsi, 4, 4M, 4si, 4siMX & XL300	4mb	$259
	8mb	$519
Hewlett Packard Laser Jet IIP, III, IIIP, IIID	2mb	$149
	4mb	$269
Hewlett Packard Laser Jet II, IID	2mb	$149
	4mb	$269
IBM 4019, 4019e	2mb	$139
	3.5mb	$209
IBM 4029	2mb	$119
	4mb	$229
Epson EPL 6000	2mb	$139
	4mb	$229
Epson Action Laser II EPL 8000	2mb	$219
	4mb	$269
Cannon LBP-4, 4 Lite, 4 Plus	1mb	$129
	2mb	$179
Cannon LBP-111 & 8111 Plus	2mb	$229
Texas Instruments Microlaser and XL	1mb	$ 69
	4mb	$229
Oki Laser 400	2mb	$129
Oki Laser 800, 820	2mb	$179
	4mb	$219
Panasonic 4410 & 4430	2mb	$169
	4mb	$249
Panasonic 4450i & 4420	2mb	$149
	4mb	$239

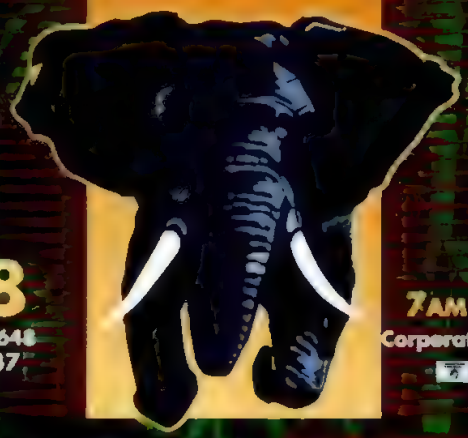
Terms and conditions: Memory [illegible] required for all returns. All unopened, unused cancel[illegible] a 15% restocking charge. Trademarks are the property [illegible] ct to change without notice.

CIRCLE 383 ON READER SERVICE CARD

MATH CO'S

IIT

3C87SX-16	$69	3C87-16 (DX)	$59
3C87SX-20	$71	3C87-20 (DX)	$70
3C87SX-25	$74	3C87-25 (DX)	$72
3C87SX-33	$85	3C87-33 (DX)	$75
3C87SX-40	$89	3C87-40 (DX)	$89



800-588-6348

7921 Professional Cir., Huntington Beach, CA 92648
Office 714-848-5958 | Fax 714-842-9437

7AM TO 5PM MONDAY THRU FRIDAY P.S.T.
Corporate P.O.'s, Government P.O.'s, Educational P.O.'s
Same Day Shipping

MEMORY DIRECT!

DISCOVER A WHOLE NEW WAY TO WORK!

Microsoft OFFICE 4.0 for Windows

(2 STANDARD EDITION)

The Microsoft Office family of programs are designed to work together, so you get more work done faster and easier. Shared tools, toolbars, menus and dialog boxes, plus support for OLE version 2.0, mean the smoothest integration and utmost compatibility. And Version 4.0 now makes it easier and more affordable than ever to get the newest releases of the most popular Microsoft programs:

Microsoft Word 6.0 for Windows — makes everyday tasks automatic and complex tasks easier. With special Help for WordPerfect Users.

Microsoft Excel for Windows — works the way you want to, with automatic functions, and even a special Help feature for Lotus 1-2-3 Users.

Microsoft PowerPoint for Windows — for great presentations at the click of a button.

Microsoft Mail Workstation License — connects you to the easy-to-use e-mail system for PC networks.

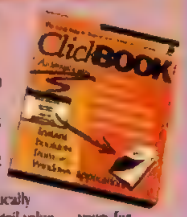
Upgrade: UP2023 ..... $239.95 **Tradeup: SI1433 ..... $279.95**

Full Version of Standard Edition and Full Version of Professional Edition (which includes Microsoft Access) are also available. Call for details

BONUS OFFER!

Just $15.95*

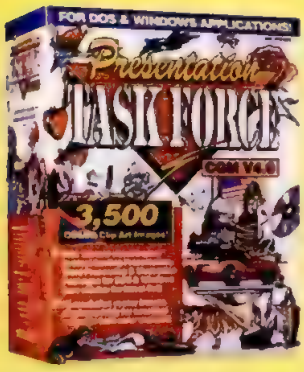
ClickBook



This innovative program lets you print Windows documents as a book — in just two clicks! Print address books, price lists, manuals, marketing plans, event programs, and more! Just pick the size, and ClickBook automatically handles the rest! It's a $69.95 retail value — yours for only $15.95* when purchased with Microsoft Office 4.0. Shipped in special promotional packaging. Ask for item #SP1303. **While supplies last*

Here's how the Microsoft Office Upgrade works:

1. **UPGRADE:** If you own any previous version of Word, Excel or PowerPoint, order Office and you'll receive the new Word 6.0, the Mail Workstation License, plus The Automatic Upgrade to Excel 5.0 and PowerPoint 4.0 as soon as they're available.
2. **TRADEUP:** If you're trading up from another word processor, presentation or spreadsheet package, order Office and you'll receive the new Word 6.0, the Mail Workstation License, Excel 4.0 and PowerPoint 3.0, plus The Automatic Upgrade to Excel 5.0 and PowerPoint 4.0 as soon as they're available.



★Presentation Task Force CGM Clip Art 4.0

Now you can own the clip art *PC Magazine* recently called..."The best CGM clip art package for overall quality and usability." Presentation Task Force 4.0 is the only clip art product to feature over 3,500 high quality, color illustrations in one value packed, comprehensive volume! Use PTF clip art to enhance presentations, newsletters, and spreadsheets created with over 60 leading DOS and Windows applications, including: CorelDRAW!, Designer, Harvard Graphics, Microsoft Publisher, PageMaker, Persuasion, PowerPoint, Quattro Pro, Ventura Publisher, Word for Windows, WordPerfect, and many more! PTF 4.0 contains people, animals, business symbols, medical illustrations, holidays, sports, military, and environment-related images.

Publisher: New Vision Technologies, Inc. GR3174

$94.95

★386MAX Version 7.0

New 386MAX and BlueMAX versions 7 are the most advanced memory management solutions available. They intelligently manage memory to reduce the overhead associated with running data compression and antivirus utilities, networks, CD ROMs, sound cards, fax/modem boards, and scanners. By leveraging Windows' multitasking capabilities, the new versions make DOS under Windows better than DOS itself. The Qualitas PIF editor makes optimizing DOS for Windows a snap. DOSMAX, WinSmart and ExtraDOS team up to deliver more conventional memory than ever before. Both new versions include the Qualitas Memory Tester, the most comprehensive memory test facility available. Special support for DOS 6's MultiConfig facility let's you easily optimize your memory for multiple system configurations. ***Also available BlueMAX Version 7 UT3653 $65.95.***

Publisher: Qualitas

386MAX 7
UT3643

$61.95

★PharmAssist

PharmAssist provides complete details, up-to-date listings and hundreds of full-color illustrations on prescription and non-prescription drugs, along with step-by-step first aid techniques and information on required travel vaccinations and worldwide health alerts. An abused drug section includes names of commonly abused drugs, signs of drug abuse, and abuse hotlines.

HH0323

$39.95

★UFO

UFO provides evidence of extraterrestrial phenomenon with its extensive database of 500 documented sightings which cover a time span of almost 3,000 years from 1000 BC to the present. Improve your understanding of UFO's by studying more than 100 of the photographic images available. ***Also available UFO CD ROM (1200 photographic images on CD-ROM)*** **ED6140 $35.95. UFO ED6133**

$29.95

★BodyWorks 3.0

Explore the human body's systems, structures, and functions in fascinating interactive detail. An extraordinary reference tool, BodyWorks also includes a special Health section with information on first aid, general fitness, and sports injuries. Now comes for both DOS and Windows in the same box.

ED2873

$39.95

Publisher: Software Marketing

MicroWAREHOUSE®

1720 Oak Street, P.O. Box 3014, Lakewood, NJ 08701-3014
©1993 Micro Warehouse Inc

- Visa and Mastercard accepted
- Your credit card will not be charged until your order is shipped
- Purchase orders subject to credit approval
- All products covered by 120 day ltd warranty. Defective software replaced immediately. Hardware replaced or repaired at our discretion
- Connecticut, New Jersey and Ohio residents add applicable sales tax
- Orders for in-stock items placed by 12:00 midnight (E) weekdays, (barring system failure, etc.) ship overnight by Airborne Express. (Some areas require an extra day)
- Shipping charge $7 per order up to 7 lbs. $1 per lb. above 7 lbs
- UPS ground service also available upon request - $3 per order
- UPS orders placed by 3:00 p.m. (E) weekdays, ship same day
- Actual freight charges apply for computers, hard disks, Bernoulli's, tape backups, monitors, and printers
- Alaska, Hawaii, outside continental U.S., APO/FPO call for information
- Item availability and price subject to change without notice
- We reserve the right to limit quantities
- Some products not available outside U.S. Please call for more information
- Not responsible for errors or omissions

Call for Overnight Upgrades!

I'm Kerry, call me at:

MicroWAREHOUSE®

1-800-367-7080

Order Toll-Free 24 Hours a Day, 7 Days a Week
Inquiries: 908-370-0518 Fax: 908-905-5245

Free Catalog Subscription FCD194B

Check the appropriate box(es) to receive a free, one-year subscription and mail this coupon to:
1720 Oak Street, P.O. Box 3014, Lakewood, N.J. 08701-3014

Name: _____

Address: _____ Apt.: _____

City: _____ State: _____ Zip: _____

○ MicroWAREHOUSE ○ CD-ROM ○ Data Comm WAREHOUSE
○ MacWAREHOUSE

(Expect to receive your next issue within 4-6 weeks)

©Copyright 1993 MicroWarehouse, Inc. MacWAREHOUSE™ is a division of MicroWarehouse, Inc. MacWAREHOUSE™ and MicroWarehouse™ are registered servicemarks of MicroWarehouse, Inc.

CIRCLE 225 ON READER SERVICE CARD

How PC Direct Helped Computer Discount Wa Found "Customer Univ

All the employees at the Computer Discount Warehouse are still in school. No, they're not teenagers anymore, but they're all enrolled in a program called CDW University — which they also call "Customer U."

"We believe that the only way to grow is to make the customer #1," says Michael Krasny, the company's CEO. "That's why we established an on-going, mandatory training program that focuses on customer service and product briefings. Our employees also have personal, hands-on experience of a lot of the products they sell — and they know how to treat the customer right."

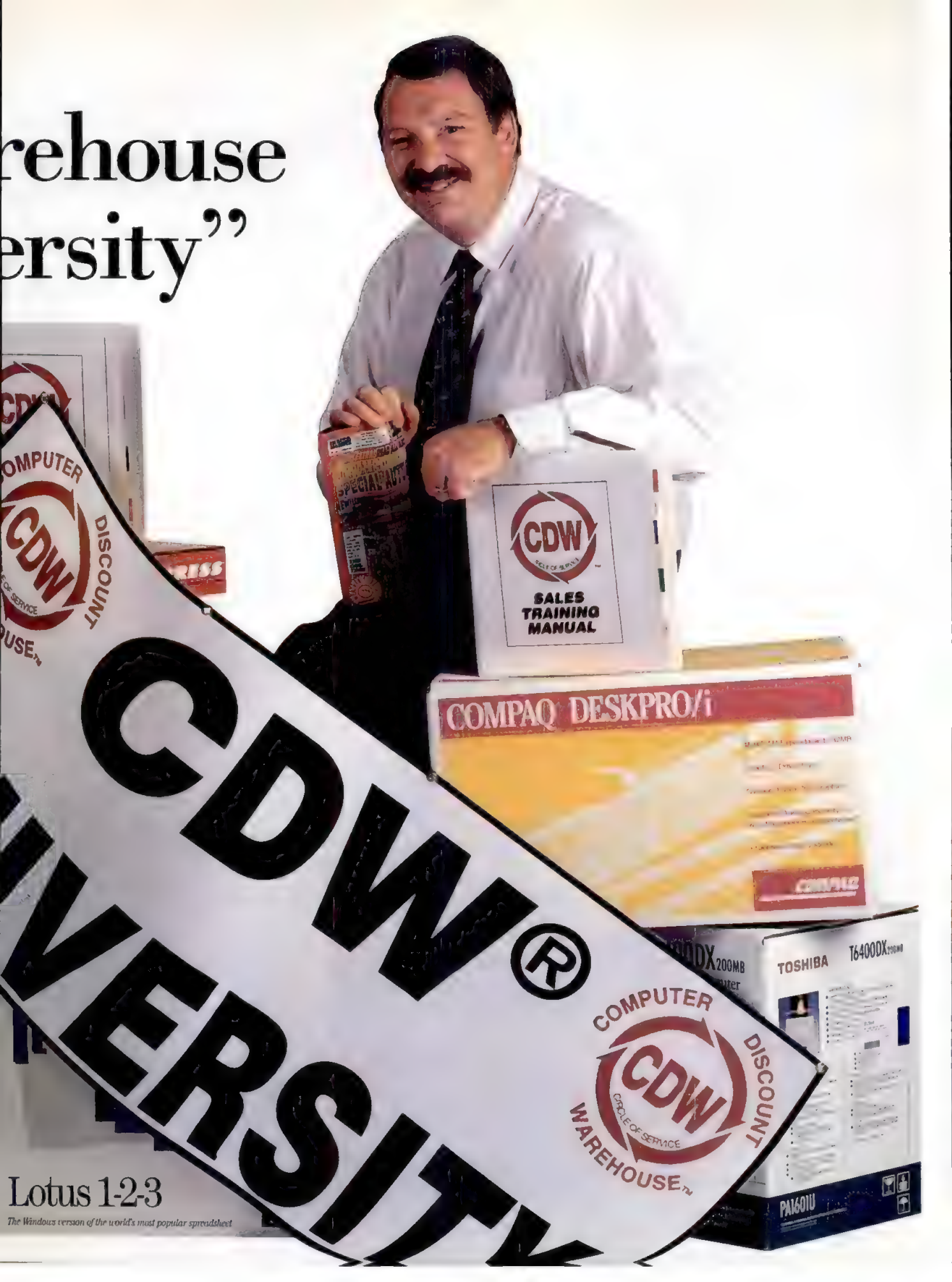
The customer support program at CDW, a ten-year-old reseller of PC hardware and software, includes free technical support from 8 a.m. to 7:30 p.m. "We guarantee that support calls will be answered within three minutes," says Krasny. He also points out that a $10 million product inventory makes it possible for the company to provide same-day order shipment.

Computer Discount Warehouse has turned their success into an opportunity to offer better customer service, and Krasny singles out his advertising in PC Magazine as the cornerstone of his success. "We've been in the PC Direct section since 1986, and we've never missed an issue. Our most loyal customers, the ones who appreciate service, come to us through PC Magazine. No matter how you look at it — closing rate, calls per ad dollar — PC Magazine is tops."

If you're a direct marketer and you're looking for one million prospects who understand value and service, look no further than PC Direct. There's no better way to attract so many loyal, repeat customers.

PC DIRECT

The Purchasing Source for Direct Buyers


rehouse
ersity"
CDW
SALES TRAINING MANUAL
COMPAQ DESKPRO/i
TOSHIBA
T6400DX
PA1601U
CDW®
VERSITY
COMPUTER
DISCOUNT
WAREHOUSE
CIRCLE OF SERVICE
Lotus 1-2-3
The Windows version of the world's most popular spreadsheet

SPECIAL OFFER:

THE PC MAGAZINE CD For Only $14.95

Introducing PC Magazine CD, the first interactive version of PC Magazine

Advertising and demos from the following companies:

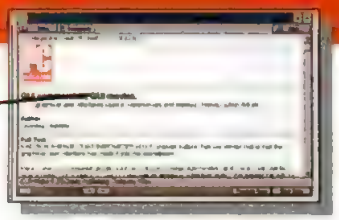
WordPerfect SIX0 WINDOWS

Microsoft Office

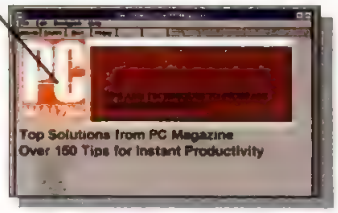
PAGEKEEPER

COREL DRAW! The Best in Graphics ...and more!

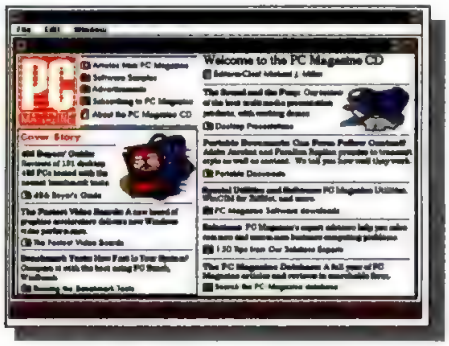
FileMaker Pro



• ***Your Product Research Made Easy!*** *Find a particular product or do your own category round-up -- a year's worth of PC Magazine articles in a full-text, searchable database makes it easy.*



• ***Plus -- Windows Utilities to Help You Manage Your Resources.***



• ***Test Your System!*** *... against 191 of the latest 486-based desktops with WinBench and PCBench executables.*

• ***Pick Your Next Video Board*** *PC Magazine's graphics technology survey will help you find the best.*

• ***See the Best Multimedia Presentation Software IN ACTION!*** *This review covers the field and it's accompanied by working demos.*

It's an industry first! Now, on one information-packed CD you'll have access to select reviews from the latest issue of PC Magazine, product demos, hot new utilities, plus the last year of PC Magazine articles in a searchable database.

Best of all, you can test your system with our new benchmark executables and see where it ranks among 191 of the top machines on the market.

PC Magazine CD is loaded with exciting additional features that only interactive technology can offer you, and it's yours for just $14.95, plus $3.00 shipping and handling.

Join us for a few revolutions. Call 1-800-787-9677 and place your order today.

User system requirements: The PC Magazine CD is designed to run on a 386 or higher PC-compatible machine with 4MB RAM and Windows 3.1.

PC MAGAZINE CD

A new spin on a classic

Use your credit card to order the first issue of PC Magazine CD today!

800-787-9677

Or fax your order to : 919-380-2879

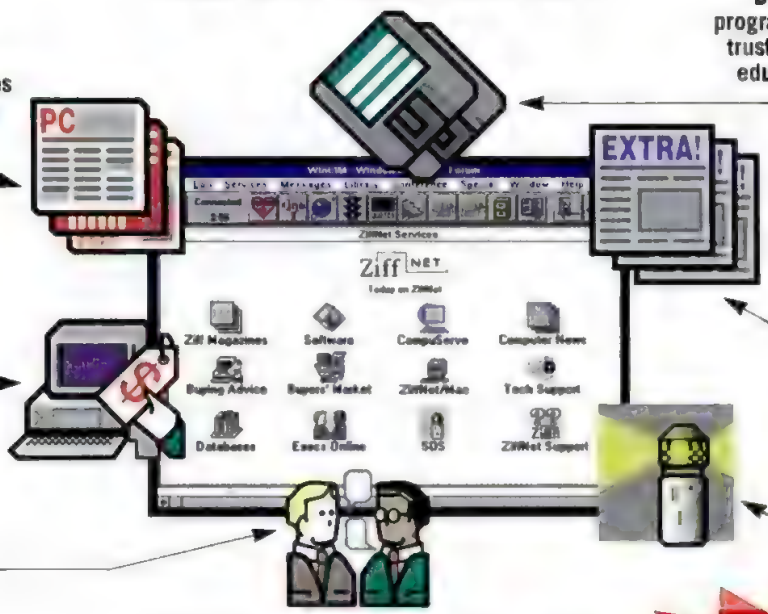
Call to order now!

To receive PC Magazine CD for just $14.95 plus $3.00 shipping and handling. Overnight delivery additional -- ask about our shipping options. Act fast -- quantities are limited.

WHERE CAN YOU MEET COMPUTER INDUSTRY LEADERS, TOP EDITORS AND BATTLE AN ALIEN NATION— ALL BEFORE LUNCH?

Exchange opinions with editors and columnists and download utilities featured in Ziff magazines like *PC Magazine, PC/Computing, Windows Sources* & more.

Download thousands of top-rated programs, handpicked by people you trust...games, utilities, Windows,™ education, graphics & much more.



Consultants and buyers turn to ZiffNet's vast databases for product and price information, plus advice from experts and fellow members.

Get tomorrow's news today with *PC Week* online the Friday before it's printed — plus the award-winning international daily newswire, NewsBytes.

Talk directly to product managers and executives from companies like Microsoft,® Lotus,® IBM® and Adobe...let them know what you think.

Instant help for computer problems 24 hours a day with ZiffNet's one-of-a-kind Support On Site database.

ONLINE, ON ZIFFNET!

FREE Starter Software!

A wealth of computing resources is waiting for you.

Sign on to ZiffNet and join the over 200,000 computer users who've already discovered the benefits of being part of our online community. You'll connect with computer industry leaders, Ziff editors and other knowledgeable computer users like you.

On ZiffNet you can call up any article or product review ever printed in the Ziff magazine archives... make sure you're getting the right products at the best prices by consulting ZiffNet's Buying Advice and Buyers' Market databases...check out our extensive, highly regarded Software Library with thousands of programs, including exclusive ZiffNet custom utilities, like the "Gates Does Windows" screensaver. And this is just the beginning — you won't find the information and resources ZiffNet offers anywhere else!

Join now and get FREE Starter Software, plus $15.00 of online time!

Call 1-800-848-8199 today and we'll send you the ZiffNet edition of WinCIM (the Windows version of CompuServe® Information Manager), your ZiffNet ID and password and a $15.00 credit toward online time — all absolutely FREE!

Current CompuServe members can join ZiffNet by typing GO ZIFFNET from anywhere on CompuServe. Join now and you'll also receive our information-packed New Member Kit, plus a FREE download of specially selected screensavers when you log on the first time. Just type GO SCREENSAVE.

So, why not join ZiffNet today! We're waiting to welcome you online right now.

Call 1-800-848-8199 and ask for ZiffNet's WinCIM offer or type GO ZIFFNET today!

Ziff NET

All about computing online.

ZiffNet membership fee is just $2.50 a month. Standard connect-time charges apply for certain services like downloading software. Rates are fully explained online, GO RATES. Offer expires 7/31/94.

CIRCLE 385 ON READER SERVICE CARD

Here's the Most Comprehensive Source of Computer Information *Anywhere*

GET:
Accurate, up-to-date information to make informed decisions.

LOCATE:
Hard-to-find products for special needs.

DETERMINE:
Whether products are compatible with your current equipment and systems.

LEARN:
Tips and techniques to improve hardware and software performance.

SAVE:
Time and money. Access thousands of articles and product specs that'll help you make better decisions.

EVALUATE:
Competitors' products and marketing strategies, instantly.

FIND:
Tech support, sales, and fax numbers. Addresses and company stats too.

COMPARE:
New products. Know where you stand, whether you're buying or selling.

Computer Select

The Fastest, Easiest Way to Get Computer Product and Industry Information

- 75,000 articles from over 160 publications
- Over 13,000 company profiles
- 75,000 product specs
- Updated monthly

"...tons of useful information about the industry, including a year's worth of articles from every conceivable computer-related publication."

John C. Dvorak, PC/Computing

"...Computer Select provides not just the information we need, but also a way to find it and a convenient way to store it."

Esther Dyson, Editor, Release 1.0

Call **1-800-827-7889** ext. 415

Federal Government Employees: Call 1-800-759-9103

*One free disk when you subscribe.

©1993 Ziff Communications Company. Computer Select is a registered trademark and Computer Library is a trademark of Ziff Communications Company. All rights reserved.
Offer expires December 31, 1993.

Ziff COMPUTER LIBRARY™

CIRCLE 158 ON READER SERVICE CARD

PC MAGAZINE MARKETPLACE INDEX

Premier
The color showcase that puts the spotlight on leading-edge PC products and services.
377-386

Windows
An every-issue four color section featuring quality products for the Windows environment.
386

Classified
Flexible-format display advertising: computer systems, components, software and more.
387-398

BusinessCard
A forum for innovative, hard-to-find and low cost PC hardware, software and services.
401-404

	Premier	Classified
HARDWARE		
Boards/Components/Chips	378	387
Communications	378	
Computer Systems	380	387
Input/Output Devices/Barcoding	380	389
Mass Storage Devices	381	391
Midi		
Multi-Media	382	
Networking	383	
OS2		
Security		
Video	383	

	Premier	Classified
SOFTWARE		
Artificial Intelligence		
Business Applications	383	391
—Accounting		
Communications		
Education		392
Financial		
Graphics/Design		392
Multi-Media	384	393
—Midi-Music		
Personal		393
Public Domain		
Scientific		

	Premier	Classified
Security		393
Shareware		393
Systems/Languages		
Utilities	385	396
Vertical Applications		
Adult		396
SUPPORTING PRODUCTS		
Information Resources	386	396
Services		394
—Data Conversion		394
—Data Recovery		
—Software Duplication		394
Supplies		395

The "Most Innovative" Software Of 1993 Is Also The Most Useful.

Plug in to POWER TRANSLATOR™ from Globalink®, the software package named "the most innovative of 1993" by *Discover Magazine*.

POWER TRANSLATOR features speeds up to 100 times faster than human translators, easily-updated dictionaries of over 250,000 words and phrases, and a 90%-plus accuracy rate!

Now, getting grammatically-correct translations of words, phrases or entire documents in Spanish, French or German to/from English is as easy as the push of a button.

Find out about the software package that's got *Discover Magazine*—and a lot of other people—talking. Call Globalink today and ask about POWER TRANSLATOR, your ticket to world-wide communication.

Globalink, Inc.
9302 Lee Highway, Fairfax, VA 22031-1206
Intl.: 1-703-273-5600
Fax: 1-703-273-3866
1-800-255-5660
U.S. and Canada

CIRCLE 751 ON READER SERVICE CARD

LOW COST MINIATURE CONTROLLERS

Save time. Save money.

Our wide range of C-programmable miniature controllers are ideal for control applications, data acquisition, and test and measurement. Compact and low in price (the Little PLC™ above is 2"×3" and $195), these controllers are programmed with our easy-to-use Dynamic C™ development system. Our controllers feature digital I/O, ADCs and DACs, relays and solenoid drivers, RS232/RS485 serial ports, battery backed memory and time/date clock, LCDs, keypads, enclosures and more!

Z-WORLD ENGINEERING

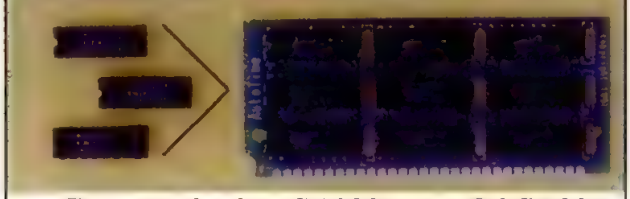
1724 Picasso Avenue
Davis, CA 95616
916.757.3737
916.753.5141 FAX

24-Hour Information Service 916.753.0618
Call from *your* FAX and follow the instructions

CIRCLE 754 ON READER SERVICE CARD

DIP to SIMM

Call on Other RAM Conversions



Convert obsolete *RAM* into useful *RAM*

NEW BOARD retrofits surplus memory into a SIMM module format

DIP to SIMM		SIP to SIMM	
Board Only (You Solder)	$ 8.50	Send Your SIP Modules & We Retrofit to SIMM	$13.50
Send your Chips (We Solder)	$ 13.50		

AUTOTIM
24 Hr Faxbak (503)452-0208

6605 SW Macadam - Portland, OR 97201
Ph: (503)452-8577 Fax: (503)452-8495

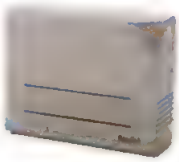
CIRCLE 752 ON READER SERVICE CARD

CIRCLE 753 ON READER SERVICE CARD

STOP COPYING FAXES!

PLAIN PAPER FAX

From Your Printer with *FaxPak*



- No Computer Required
- Connects to Serial or Parallel Printer Port
- Connects to PC or Net Server to Share Printer
- Receives and Stores Faxes if Printer is Busy or Off
- Built-in Auto Switch to Share Phone Line with Telephone, Fax, and Answering Machine
- For Laser, Inkjet and Dot Matrix Printers
- 2 Year Warranty. 30 Day Money Back Guarantee.

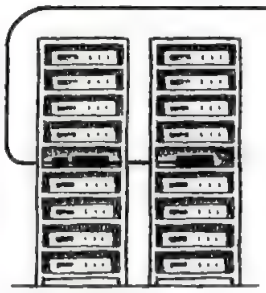
$249
* Reg. $299

Teledisk Systems, Inc.
2401 Mariship Way Sausalito, CA 94965

Orders: 1-800-669-3700

CIRCLE 755 ON READER SERVICE CARD

COMMANDER



Dealer Program Available
Made in USA

Control up to 96 file servers with one keyboard, monitor and mouse!

- Supports PC, PC/XT, PC/AT, PS/2 and 100% Compatibles
- Remotely switch PCs via keyboard up to 150 feet away
- "AutoBoot™" Feature boots attached computers without operator intervention
- Supports either PS/2 or Microsoft/Logitech serial mouse
- Each unit accommodates from 2 to 8 PCs; cascade up to 12 units.

CYBEX

4912 Research Drive
Huntsville, AL 35805 U.S.A.
(205) 430-4000
FAX (205) 430-4030

IBM, PC, PC/XT, PC/AT and PS/2 are registered trademarks of International Business Machines Corporation.
Microsoft and Logitech are registered trademarks of their respective companies

CIRCLE 756 ON READER SERVICE CARD

It has Einstein's brain, Van Gogh's canvas & more ports than San Francisco.

486DX-33, DX2-50, DX2-66
Upgradable CPU
9.5" Detachable and upgradable LCD panel
- Active Matrix Color
- Dual Scan Color
- Monochrome

Local Bus Video
Upgradable to 1MB Video Memory
Upgradable to 32MB RAM
Upgradable Hard Drive

Removable 1.44MB floppy drive (allows for 2nd battery pack)
2 type II PCMCIA Slots or 1 type III
Ergonomically designed keyboard with 25mm built-in trackball
Built-in digital audio
Built-in speaker & microphone
Rechargable NiCd/NiMH battery
Optional Docking Station

800-5-COMMAX In CA: 408-435-5000

COMMAX TECHNOLOGIES, INC. 2031 Concourse Drive, San Jose, California 95131 • Fax: (408) 435-5005

CIRCLE 757 ON READER SERVICE CARD

How light it is...

The 486 **SubBrick**

486SLC-25
3.8lbs,7x10x1.6"
2 Type II PCMCIA
8.5" Backlit LCD
80MB HD, Max170MB
4MB RAM, Max 20MB
4-6 Hr. Battery Life
4 Year GE Warranty

just $1,495

For the lightest in on-the-go computing our new 486 SubBrick is the perfect PC for those who can't take too little. Like all Ergo NoteBricks, it's backed by a four Year GE service protection plan so you can travel lite and worry free. Call for complete info on the best notebooks ever.

The PowerBrick 66
486DX2-66, 4-32MB RAM, 128-500MB HD, VL Active & Dual Scan Color, Mono, 2 Type II PCMCIA, 6lbs
from **$2,395**

The NoteBrick 33
486SLC-33, 4-8MB RAM, 120-200MB HD, 10" Mono or 9" Color LCD, fax-modem
from **$1,395**

Call M-F, 9-6 EST
800-633-1925

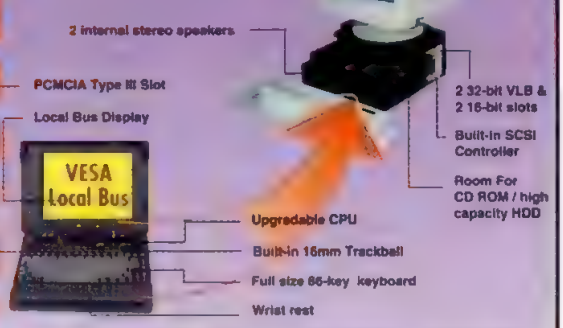
ergo COMPUTING

24Hr. Automatic FAX Info
800-723-0778
code 1235

One Intercontinental Way, Peabody, MA 01960 (508)535-7510 FAX (508)535-7512

CIRCLE 758 ON READER SERVICE CARD

VL BUS NOTEBOOK



- 10" Active Color / Dual Scan / Mono
- 32-bit VESA LB Video & IDE
- 128K Cache (Optional)
- PCMCIA (Type III or 2 Type II)
- 4MB (Exp. to 8, 12, 16 or 20MB)
- 1.44 Floppy Drive
- 120MB HDD (170, 200, 340 or 520MB)
- Serial, Parallel, Ext. K.B., SVGA ports
- Carrying case, Battery, Adapter
- 11" X 8.6" X 1.9" 6.6 lbs. (w/ battery)
- Supports Windows NT, OS/2, heXTStep

Options
- VESA LB Docking Station
- PCMCIA Fax/Modem

Model / Intel CPU	820 M Mono	820 S Dual Scan Color	820T Active Color
486SX-33			
486DX-33			
486DX2-66			
Super Docking Station			

To Order: 1-(800)728-6688

CYPRESS COMPUTER, INC. 26120 Eden Landing Rd. • Hayward, CA 94545
(510) 786-9106 • FAX (510) 786-9553

CIRCLE 759 ON READER SERVICE CARD

PARALLEL-TO-SCSI CONNECTIONS!

This product is darned near perfect —**Jerry Pournelle, Byte Magazine 3/93**

This year the company outdid itself. The MiniSCSI Plus is even more elegant than its predecessor and almost twice as fast —**Jim Seymour, PC Magazine 12/92**

Add up to 7 SCSI devices to your parallel port and still use your printer!

Up to twice as fast as our original **MiniSCSI**™ parallel-to-SCSI adapter, the **MiniSCSI Plus** adapter lets you run a CD-ROM, tape backup, SyQuest®, Bernoulli® or other SCSI device from almost any parallel port. For most notebook users, it's the only way to use SCSI devices. An integrated cable makes it a snap to share SCSI devices with desktops.

KEY FEATURES: 100% Printer Passthrough ▲ Weighs Just 7.2 Ounces ▲ Fully Compatible With Bidirectional and Unidirectional Parallel Ports ▲ Powered By SCSI Bus ▲ Only $219

See your dealer or call: **1-800-TRANTOR**

Trantor Systems Limited
5415 Randall Place • Fremont, CA 94538-3151
FAX: (510) 770-9910
Adaptec Interactive Fax: (408) 957-7150

Trantor ▶An Adaptec Company

© 1993 Trantor Systems Limited. MiniSCSI and Trantor are trademarks of Trantor Systems Limited. All other trademarks used are owned by their respective owners.

CIRCLE 760 ON READER SERVICE CARD

STAND-ALONE LCD MONITORS

STN Color or Monochrome

NEW! DUAL SCAN

$1595 | DATALUX introduces its new high quality, high brightness color LCD monitor in the same case as the popular Monochrome version.

- 640 x 480, 256 Colors, VGA compatible, 2 CCFT backlights
- Driven by ISA Bus Controller Card, no external power supply, optional CRT output
- Adjustable desk stand, folds for wall mounting or portability, 1.75Kg weight
- 197 x 147mm display (9.4 inch diag), non-reflective glass face
- Contrast ratio of 15:1, 200ms Rise and 150ms Fall time

$795 | Monochrome version 640 x 480, 64 gray shades. Wide viewing angle.

Also Available

- Mobile/ Industrial model sealed against spills and splashes in rugged drawn aluminum housing with optional swivel mount.
- Touch Screen Version. Capacitive technology. Provides high resolution, fast response, all glass scratch proof optically clear sensor. Complete with built-in controller and software.

To Order Call Toll-Free: **1-800-DATALUX**

DATALUX
155 Aviation Drive • Winchester, VA 22602

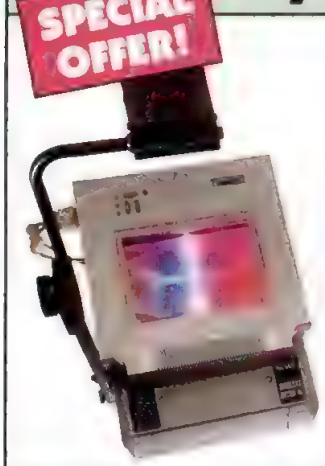
Tel: 1-703-662-1500
FAX: 1-703-662-1682
AutoFAXed Specs: 1-703-662-1675

CIRCLE 762 ON READER SERVICE CARD

Bright color. Bright price.

$2,599.

SPECIAL OFFER!



The BOXLIGHT 1285 ColorShow Projection Panel. Our brightest true-color panel. And for $950 off the list price, it's an unbeatable value.

- Compact, easy-travel panel
- 640 x 480 resolution
- PC and Mac compatible
- FREE remote and cables

Your direct source for all the bright answers.

- Widest selection
- Instant availability
- Overnight shipping
- 30-day guarantee

BOXLIGHT®

17771 Fred Dr. N.E., Poulsbo, WA 98370

Call Today 1-800-497-4007

CIRCLE 761 ON READER SERVICE CARD

ONLY ONE THING COULD BE EASIER THAN OUR BAR CODE PRINTING SOFTWARE.

StrandWare offers you a full line of easy to learn, easy to use bar code printing software packages. In less than an hour, you can be printing most popular bar codes with virtually any printer. We also offer Bar Code Library, which lets you print bar codes from within your own programs. Call (800) 552-2331 or fax (715) 833-1995.

StrandWare®
For Anyone Who's Keeping Track.

CIRCLE 763 ON READER SERVICE CARD

Tired of addressing envelopes the hard way?

"Just drop it in the slot!" The Envelope Toaster addresses any size envelope while your letter prints on your regular printer.

No typewriters. No jammed laser printers. No handwritten envelopes. No ugly labels.

$349 includes envelope printer, DOS & Windows software. Works with word processors, contact managers, etc. Connects to serial or parallel port.

addressEase, Inc. Box 3200, Maple Glen, PA 19002
Phone 215-641-1837 Fax 215-641-9521

TO ORDER CALL 800-TOAST-IT

Envelope Toaster™ takes the nuisance out of addressing envelopes.

CIRCLE 764 ON READER SERVICE CARD

New Products Expand Award Winning Tape System Family!!

NOW all of the PCTD-1 features that earned PC Magazine recognition as "Editor's Choice" and "the clear winner among nine-track back-up devices" are available with a complete line of NineTrack 3480/3490 SCSI Controller Kit and tape subsystem solutions. Like the PCTD line, the new SCSI line reads/ writes to 9-track and 3480/ 3490 tape with your IBM*PC/XT*/AT* 386,486, PS/2*andcompatibles. Exchange data withother PCs, minis and mainframes using a variety of tape densities.

3480/3490 (IDRC) & NineTrack system features:

- Auto & cartridge load systems
- Data transfer rate up to 43.55 MB/minute
- Interchange & backup software
- Rec/View data extraction & conversion software
- 800/1600/3200/6250 bpi & 3480/3490 (IDRC) systems available
- Toll-free direct access to dedicated product line technical support

COMPUTER LOGICS

800-828-0599
Fax 216 349-8609

CIRCLE 765 ON READER SERVICE CARD

MACWORLD MW EDITORS' CHOICE — WORLDS SMALLEST PORTABLE

New low prices — PC WORLD BEST BUY — DATA STORAGE

Battery, PS, Charger, & Parallel Card all inside.
Mac and IBM (works on both) No cards needed!

Black or Apple Platinum

NEW! 1.8"x6.8"x9.5"
256MB /128MB 3.5" Cart. MOST Read/write Optical at 35ms **OR** 650MB 5.25"Cart read/write Optical at 40ms **SHARP.** At as low as 25¢ per MB & >25+ year media life NOTHING IS MORE SECURE OR CHEAPER! Now with this **new small size and price** you can take your data & drive!! **Test drive our award winning optical drive.**

NEW! 2.1 Gig 2"x5"x7"
700MB-**2.1 Gig** HD 9ms

Internal Battery Optional — New 1 Gig 1.8"x4"x7"
85MB **1 Gig** Drive 10 ms 1.5-3hr battery life "Editors' Choice"

NEW! Internal Battery Optional 1.8"x4"x7"
105MB Syquest 105MB on a 3.5" disk cart, fast **14ms** access time. Great for graphic image storage and fast enough for MPC presentations. Unlimited storage/ backup at hard drive speeds. This 3.5" remov. drive is the **HOTTEST CHOICE!!**

Fastest! 2"x5"x7" 1.8"x6.8"x9.5"
2-8 Gig DAT, 160MB Tape, or 600MB Tape.
Toshiba 3401 CD-ROM **PhotoCD** Multi-Session 200ms. Fast, Light & Portable.

Removable — 5hr Int Bat Opt 1.7"x3"x5.3"
80-240MB fixed Drive or Removable(right); w/5hrs battery

1.8"x4"x7"
128MB 3.5" Cartridge Read/write Optical drive

Bernoulli! 1.8"x6.8"x9.5"
150MB Bernoulli or 88/44MB **Syquest** Cartridge Drive, 18ms 4 times smaller than Bernoulli Transportable

Active Term. now available

Liberty Systems — 375A Saratoga Ave. San Jose, CA 95129
(408) 983-1127
Fax (408) 243-2885

NO Power Supply Bricks

CIRCLE 767 ON READER SERVICE CARD

DOS FREE TIPS!

Inside DOS will show you how to use DOS more productively. You'll find timesaving shortcuts, proven methods, and step-by-step instructions in every information-packed issue. ◆ Subscribe today and we'll send you 13 issues for the price of 12 for only $39! If you decide *Inside DOS* is not for you, mark "cancel" on your invoice and return it. Your free bonus issue will be yours to keep with no further obligation. ◆ *Inside DOS* is guaranteed to help you get the most out of DOS. But don't take our word for it. See for yourself.

Call for your FREE ISSUE today!

1-800-223-8720

Please mention code V5NX

9 TRACK 3480

WINDOWS DOS NOVELL OS2 UNIX

Windows Tape Software!
Tape Backup
Tape Duplication
Tape Conversion

Get The Very Best For Less!!!

LAGUNA DATA SYSTEMS
7340 Smoke Ranch Road
Suite C, Las Vegas, NV 89128
TEL. (702) 254-2648 FAX. (702) 254-0910

800-938-TAPE

CIRCLE 768 ON READER SERVICE CARD

Will your 9-Track Subsystem....

- ✔ Offer tape speeds from 100 to 150 ips?
- ✔ Read and Write all four 9-Track Densities?
- ✔ Work in concert with other SCSI-2 devices?
- ✔ Be backed by a company who has produced 9-Track drives for over 20 years?

Features like these make *M4 Solutions* the only choice for your demanding high performance applications.

....3480/90 Solutions also in-stock

M4 — **M4 Solutions**
10855 Sorrento Valley Rd. San Diego, CA 92121
619-597-0616 Fax: 619-597-0836
800-240-8270
8 AM Eastern to 5 PM Pacific

CIRCLE 769 ON READER SERVICE CARD

9-TRACK FOR PCs

Mainframe To PC Data Interchange

Rock solid solutions, rock bottom prices.
Direct from the manufacturer. 1600/3200/6250 bpi.

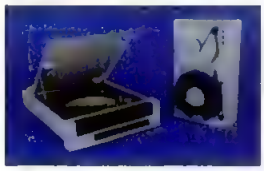
- The most trusted name in 9-track, since 1980
- Powerful, easy-to-use software tools included

Overland Data Inc.
800-729-8725
TEL 619-571-5555
FAX 619-571-0982
EUROPE:
TEL +44 734 891891
FAX +44 734 891816

Ask about 3480 with IDRC.

CIRCLE 770 ON READER SERVICE CARD

BEST 9-TRACK TAPE SOLUTION OF THE 90'S!



- PC 286/386/486
- RISC/6000 • AS/400
- SUN • HP • DEC • APPLE

Our name begins with Quality!
Call us today for price and information.

QUALSTAR®

9621 IRONDALE AVE., CHATSWORTH, CA 91311
FAX (818) 882-4081 • (818) 882-5822

CIRCLE 772 ON READER SERVICE CARD

Do-It-All Disk Drive

for Home, Office and Travel Computing!

Compact, Plug N' Play with any PC!
Mobile Disk packs up to 680MB* into a compact, portable unit. Simply plug into any portable or PC printer port and you're ready to go!

Great Backup!
Simply use DOS/Windows copy to do backup. It's easy, faster than tape and your backed up data is instantly accessible. Plus if your internal drive fails, it fills in as your primary disk.

Privacy & Security!
Secure your data easily. Unplug Mobile Disk and lock it away safely.

Mobile Disk 120/240MB*
*... disk capacity is based on use of DOS 6.0 data compression utility.
Call for other disk capacities.

1-800-873-VALU
FAX (408) 945-0948

Value Star

CIRCLE 771 ON READER SERVICE CARD

ANNOUNCING

Computer Select™

The Most Complete Database of Computer Product Information Available

With COMPUTER SELECT you'll never again risk making the costly mistake of acquiring the wrong product. Now, using your own PC, you can identify, evaluate and select the best products that meet your requirements and your budget. Easy-to-use search software lets you quickly retrieve the documents you need from the vast database of product reviews, specifications, announcements and buyer's guides.

Get instant access to more than...

- 70,000 articles and abstracts each month
- Complete specs for 70,000 hardware, software and communications products
- Profiles of 12,000 companies, including addresses and phone numbers
- 9,000 definitions of computer and telecommunications terms.

Discover the power of this new CD-ROM product. Call now for your free, no-obligation demo disk. Then, if you wish, you can subscribe for $996.*

LIBRARY™
One Park Avenue,
New York, NY, 10016

CALL NOW FOR A FREE DEMONSTRATION DISK
212-503-4400

Computer Library and Computer Select are trademarks and Data Sources is a registered trademark of Ziff Communications Company. ©1991 Ziff Communications Co.

*U.S. and Canada only. Outside U.S. $1195

HIGH-END SOUND, LOW-END PRICE

THE SOUND ENGINEER DSP™

- Integrated software & hardware for signal processing simultaneously provides real-time compression/decompression, reverberation, 20 band equalizer, and more!
- Based on the STAR™ Semiconductor SPROC™ processor; the most flexible and powerful audio DSP available
- Internally 4 parallel DSPs run up to 40 million instructions per second (40 MIPS).

THE ORCHESTRA

- OTTO synthesizer chip is the same chip used in the world-renown professional ENSONIQ™ ASR-10 Synthesizer™
- Uses ENSONIQ Soundscape™ Technology
- Hardware generation of 32 simultaneous voices, 32 polyphonic notes, envelopes, & panning
- Uses the ENSONIQ sound library; the world's largest wave table library!
- Absolutely no "stutter" -- Unlike others, our audio record/playback maintains 4k buffers. No overhead audio record/playback with Audiobuffer™.

THE CONDUCTOR

- On-board Motorola™ MC68EC000 microprocessor off loads the PC and makes SoundTrax self-sufficient.
- Allows for enhanced board capabilities.

They're not going to believe us. $289 for all these features? Record and playback at 44.1 KHz, Wave Table Synthesis, compatible with all popular sound board standards...that's just the beginning.

Unlike other brands, our DSP earns its keep. Very few offer compression/decompression, reverb, chorus, and a true 20 band graphic equalizer.

MOST OTHER BRANDS		SOUNDTRAX
Base System	$260	$289
Hardware Wave Table Synthesis	$200	Included
SCSI CD ROM interface	NO	Included
Sony™ CD ROM interface	A Few	Included
On board microprocessor	NO	Included
Real Time Compression/Decompression	A Few	Included
Simultaneous Record and Playback	NO	Included
Reverberation	NO	Included
4K Audio Buffering DMA	NO	Included
4 in 1 DSP	NO	Included
Usable DSP Effects	Few, if any	Included
MPU 401, MT-32, General MIDI	A Few	Included
Separate A/D and D/A for improved performance over single CODECs	NO	Included

SoundTrax won't tie up your host computer with needless overhead. Our Motorola 68EC000 runs a complete, self-contained operating system for the sound board. *Forget about stutter.* Our PCM record/playback maintains 4k fast Audiobuffers so you don't miss a beat. Our secret is revolutionary architecture. Three separate processors work together to provide an impressive array of standard features. **Finally, we're not playing the add-on game.** All necessary hardware and software is included. Professional sound, all the extras, one low price.

only **$289**
including 2 day shipping
30-Day Money-Back Guarantee

7 Year Guarantee

1-800-260-6771

SoundTrax™ by KALIX™ Ltd

KALIX, Ltd, SoundTrax, Sound Engineer DSP, and Audiobuffer are trademarks of Kalix Ltd. All other trademarks are property of their respective holders. Prices & specifications subject to change without notice.

CIRCLE 774 ON READER SERVICE CARD

VGA▸TV Elite. Big-Screen Multimedia Presentations Made Easy.

Under $400!

FEATURES
640x480 resolution
16.7 million colors
Flicker-free video
Light weight

Just connect VGA-TV Elite to a VGA card and any TV and *presto!*...big-screen presentations. It's that simple. Compare VGA-TV Elite's features to any of the alternatives (all unwieldy and costing up to 10 times as much), and you'll easily see there simply is no other choice.

FREE! With every VGA-TV Elite, get "Presentation Tools" software—featuring 3 super presentation features

Advanced Digital Systems
Call **(800) 888-5244.** 8am–6pm M–F Pacific Time
20204 State Rd•Cerritos, CA•90701•(310)865-1432•(310)809-6144 (Fax)

ADS VGA-TV Elite. Easily the Best.

CIRCLE 775 ON READER SERVICE CARD

Program Your Business For Success

MicroBiz AUTOMATE YOUR BUSINESS

COMPUTERIZE YOUR BUSINESS & WATCH YOUR PROFITS GROW!

- Increase Control
- Increase Profits & Sales
- Work Smarter, Not Harder
- Bar Code Readers, Cash Drawers and More
- 220 Volt Hardware Available
- Foreign Languages Available

800-637-8268

We Provide Hardware/Software That Is:
- ✔ Affordable & Functional
- ✔ Easy to use
- ✔ Tested & Stable
- ✔ Unparalleled In Technical Support

Main Phone: (914) 425-9500
Fax: (914) 425-4568
24 Hr. BBS: (914) 425-6440
Fax on demand: (914) 425-6064
Dealers Welcome: 800-SELL-POS (800-735-5767)

CALL TODAY FOR A FREE CATALOG

CIRCLE 778 ON READER SERVICE CARD

3480•9-Track•4mm•8mm

DOS-OS/2-Unix Windows-Networks RS/6000-SUN (602)396-3616

Data Interchange Solutions
Data Conversion
Tape Duplication
Backup & Restore

$400 with LOAD!

novastor corporation
30961 Agoura Road Suite 109
Westlake Village, CA 91361
Fax (818)707-9902

Hardware and Software Solutions

CIRCLE 776 ON READER SERVICE CARD

77 Million Telephone Numbers On CD-ROM.

Pull-up the name, address and number of an old friend. Call up a list of businesses then download them for marketing. ProPhone's 10,000 phonebooks on CD-ROM give you instant access to listings information you can use now!

1-800-99-CD-ROM

PROPHONE™
The Ultimate Utility for CD-ROM.

CIRCLE 779 ON READER SERVICE CARD

FlexCam

FlexCam is the first 'plug and use' integrated camera and microphone system for desktop video. FlexCam is a 1/3", hi-resolution, color CCD camera and two microphones. The camera and microphones are mounted on a slender, 18-inch flexible wand, easily adjustable for precise camera positioning. Compatible with all video digitizing boards offered for Microsoft Video for Windows, including VideoSpigot, VideoVision, Video Blaster, Bravado, Marvel, Captivator, EyeQ, Video Surge and many more.

For more information, contact:
VIDEOLABS
5270 West 84th Street
Minneapolis, MN 55437
Phone: (612) 897-1995
Fax: (612) 897-3597

CIRCLE 777 ON READER SERVICE CARD

GoldMine

The Leading Contact Manager for Networks!

GoldMine *is the premiere network contact manager on the market. It automates the entire office into an efficient team. GoldMine combines contact management with telemarketing, sales automation, network scheduling and E-mail to provide a truly integrated system that will change the way your office works!*

GoldMine is $295 for single user, $895 for the network version, and it's backed by our no-nonsense 60 day money back guarantee!

"..GoldMine has just about everything you would want in a contact manager, either standalone or networked."
—PC Magazine

"GoldMine tops the list!"
—Mobile Office Magazine

800-654-3526

PC MAGAZINE EDITORS' CHOICE August 1993

MOBILE OFFICE MAGAZINE HIGH HONORS

ELAN SOFTWARE
17383 Sunset Blvd., Suite 101
Pacific Palisades, CA 90272

Competitive Trade-Up Only $99!

CIRCLE 780 ON READER SERVICE CARD

For quality flowcharts, go with the name you can trust . . .
EasyFlow by HavenTree

Experience the speed and flexibility of flowcharting power made easy. EasyFlow takes the drudgery out of creating presentation quality flowcharts, organization charts and data flow diagrams. Powerful text handling features, export capabilities and shape creation make it the #1 DOS-based flowcharting program available today. But don't let all of this power fool you. EasyFlow still lives up to its name. If you don't believe us, give it a try. Its only $280 plus shipping and EasyFlow comes with a 60-Day Money Back Guarantee and FREE no-wait technical support.

Call today
1-800-267-0668 ext.49

HavenTree SOFTWARE

P.O. Box 470-P Fineview, NY 13640-0470
Tel: (613) 544-6035 Fax: (613) 544-9632

AD0009-930601

CIRCLE 781 ON READER SERVICE CARD

Elvis Is Alive

... and well, with 24 other artists in the hottest, least expensive, most professional sounding MIDI Karaoke on the market today!

Customize each song to fit your voice perfectly with our pitch and speed controls. Use any of our 25 song selection — from Broadway greats to today's biggest hits — or create your own hits ... it's easy since MIDI Karaoke uses standard MIDI files.

But wait, there's more ... Turtle Beach MIDI Karaoke is the only Karaoke application with the bouncing ball. Yes, from word to word, our bouncing ball guides you perfectly through the song so you sing the right words at the right time. AND...most, most importantly, it's the only Karaoke application that allows you to record your own voice directly to the hard drive while you're singing and then play back the entire file — music and voice together!!

So don't get all shook up. Get all this and more for only $49!

See your favorite dealer, or call 800-645-5640 and order your Turtle Beach MIDI Karaoke today.

WORKS WITH ANY SOUND CARD!

TURTLE BEACH SYSTEMS

52 Grumbacher Road • York, Pennsylvania • 17402 • 717-767-0200 • FAX: 717-767-6033

CIRCLE 783 ON READER SERVICE CARD

Create a Multimedia Presentation in 60 Minutes... GUARANTEED.

suggested retail price $149.95

SST SUPER SHOW & TELL

Now you can create a multimedia presentation in one hour! **SST** maximizes Windows 3.1 and lets you produce dynamic presentations complete with scrolling text, sound effects, narration, graphs, pictures, live motion video – even interactive capabilities. **SST** works like a slide carousel and a VCR player. It features easy-to-learn point & click and drag & drop controls. Plus, it utilizes **two revolutionary operating techniques** that no longer require you to learn complicated script languages or deal with time-based editing systems. It's the easy way to get into the multimedia action and make your presentations soar! **Satisfaction Guaranteed.** Create a multimedia presentation in sixty minutes or return for a refund. *Call for details and limitations.*

AskMe Multimedia Center
7100 Northland Circle, Suite 401
Minneapolis, MN 55428
FAX (612) 531-0645

MPC Multimedia PC

SOFTWARE RESOURCE — 1-800-879-7899
MERISEL — 1-800-637-4735
KENFIL DISTRIBUTION — 1-800-745-3634

CIRCLE 782 ON READER SERVICE CARD

Cakewalk PROFESSIONAL for Windows 2.0

"Cakewalk Professional for Windows stands at the head of its class." PC Magazine, 10/27/92

New Version 2.0!

Staff printing, built-in playlist, key macros, 48 realtime faders, MCI and wave file playback, volume and tempo drawing, loop recording, General MIDI patch names, more. Only $349. Demo disk $5. Cakewalk for DOS $150. Call about sequencer trade-ins!

800-234-1171 or 617-926-2480.
Fax **617-924-6657.**

Twelve Tone Systems
P.O. Box 760 Watertown, MA 02272

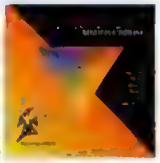
CDROM

Boost Your Productivity with These CDROMs

BY WALNUT CREEK CDROM

CICA MS Windows CDROM
This disc contains a copy of CICA, the internet's largest Windows archive, with hundreds of megabytes of MS Windows programs. Our friendly shell makes accessing all these files easy. Hundreds of utilities, including shells, disk utilities, mouse and keyboard utilities, screen savers, backup/restore programs, diagnostics, and data conversion programs. Plus games, demos for many commercial Windows programs, fonts, icons and bitmaps. There are source code listings and tools for C, C++, Toolbook, Pascal, and Visual Basic. This disc is configured for Opus, RBBS, Pcboard, Wildcat, and Spitfire BBS's. Last quarterly update in April 1993. $24.95*

The CICA CDROM changed the way I use windows!

Simtel MSDOS CDROM

Packed full of the world's highest quality MSDOS shareware — every DOS user should own this disk! With 8,818 files, Simtel contains something for everyone. Our friendly shell program will help you find whatever you need, whether it be utilities, communications programs, BBS's, editors, documentation, databases. BBS index files. Last quarterly update in May 1993. $24.95*

Giga Games CDROM
An amazing collection of games, from classic arcade to the latest windows simulations to educational games for all ages. Sports games, adventure and card games, war games, visual entertainment, trivia and word games, BBS doors and more. Also features 7,500 virtual reality files, 1,000 D&D files, and 1,800 Go files. An easy to use shell makes it simple to navigate the disk. Includes utilities and "cheat sheets" for commercial and shareware games. BBS ready. Made in July 1993. $39.95*

Hobbes OS/2 CDROM
The Hobbes OS/2 CDROM is filled with 2,772 files from the largest OS/2 ftp archive, ftp-os2.cdrom.com. 636 MB of utilities to customize your working environment. It includes the most comprehensive selection of shareware, freeware, device drivers, program updates and lots of useful information updated quarterly to help you tap into the hidden power of OS/2. BBS'ed. New friendly shell! Made in June 1993. $24.95*

Libris Britannia CDROM

Libris Britannia
From the best British shareware library, over 600 megabytes of superb public domain and shareware for the IBM PC. This disc is biased towards the technical and scientific PC user and includes extensive sections on electronics, engineering, mathematics, medicine, math and stats ham radio, and other specialist areas. With each disc you get a 124-page book which describes the software. Made March 1993. $69.95*

Ada CDROM
Over 560 megabytes of source code, utilities and documentation. $39.95*

C Users' Group Library CDROM
A collection of user supported C source code from the C Users' Group. $49.95*

CDROM Caddies An great deal at $4.95

** Shareware programs require separate payment to authors if found useful.*

CALL OR SEND EMAIL TODAY!

All the disks are unconditionally guaranteed. Please write, fax or call in your order. Shipping and handling is $5 per order (USA, Canada and Mexico). Overseas S&H $10, call +1-510-674-0783. Visa, MC, American Express and COD orders accepted.

1-800-786-9907
orders@cdrom.com
fax +1-510-674-0821

Walnut Creek CDROM
4041 Pike Lane, Suite D-519
Concord, CA 94520

CIRCLE 785 ON READER SERVICE CARD

ARE YOUR HARDWARE LOCKS GIVING YOU TROUBLE

Numerous software programs on the market use electronic physical lock devices, presumably to prevent unauthorized execution. However if you experience a problem with your lock, you may incur costly hours of lost production time.

CAN YOUR BUSINESS AFFORD TO TAKE THE RISK!

SafeSoft Systems Inc. specializes in producing quality software and hardware products to eliminate the need for lock devices. Our products are designed as insurance to protect your software investment against costly downtime in the event your lock device is stolen, lost, damaged or fails. Lock devices are made from static sensitive CMOS circuitry that is subject to physical and human mishap.

P-CARD
will emulate the Sentinel Pro

C-CARD
will emulate the Sentinel C, Scribe

*Rainbow Technologies is not affiliated with SafeSoft Systems Inc. SentinelPro, SentiinelC and Sentinel Scribe are registered trademarks of Rainbow Technologies. All products are intended for licenced users.

DON'T TAKE UNNECESSARY RISKS!
TRY OUR INTELLIGENT PRINTER PORT

These intelligent printer ports will not only add or replace a regular printer port, but comes with intelligence to emulate most of the current *Rainbow Technologies lock devices.

SAFESOFT SYSTEMS
201-1111 MUNROE AVE.
WINNIPEG, MANITOBA
CANADA R2K3Z5
Ph. (204)669-4639 or
Fax (204)668-3566

CIRCLE 786 ON READER SERVICE CARD

WARNING !!

When your system goes down in the middle of a job, there are **NO EXCUSES** !! You need a diagnostics package, from the people who brought the industry - standard **AMIBIOS**. After all, who knows your system better? **WE DO**.

At **American Megatrends**, we have created the ultimate diagnostics package, **AMIDiag**. The same package that is used by leading manufacturers, such as **IBM**, **Sequent**, **Austin Computers**, **and DFI**. Call us now and we'll tell you all about **AMIDiag**. We'll also tell you about our best selling Diagnostics Kit, our new antivirus products, and more.

AMIDiag is available at : CompUSA, Micro Center, Computer City, and other fine resellers.

Call us now :
(800) 828-9264
(404) 263-8181
(404) 263-9381 FAX

American Megatrends

All company names are trademarks of their respective corporations.

Creators of the World Famous AMIBIOS.

CIRCLE 787 ON READER SERVICE CARD

Explore the Internet - FREE!

DELPHI, a leading international online service, now offers full access to the Internet. You can explore this incredible electronic network with no risk. You get 5 hours of evening/weekend access to try it out for free!

Use electronic mail to exchange messages with over 10 million people throughout the world. Download programs and files using "FTP," connect in real-time to other networks using "Telnet," and participate in "Usenet Newsgroups" the world's largest bulletin board with over 3500 topics. If you're not familiar with these terms, don't worry; DELPHI has expert online assistants and a large collection of help files, books, and other resources to help you get started.

After the free trial you can choose from two low-cost membership plans. With rates as low as $1 per hour, no other online service offers so much for so little.

5-Hour Free Trial!

Dial by modem, 1-800-365-4636*
Press Return once or twice
At Username, enter JOINDELPHI
At Password, enter PMG41B

DELPHI

Questions? Call 1-800-695-4005 voice
Send e-mail to INFO@delphi.com

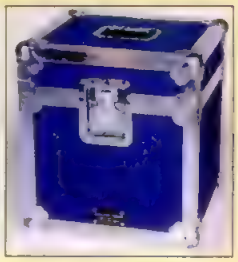
*Current Internet users can Telnet to delphi.com instead. Complete details provided during the toll free registration.

CIRCLE 788 ON READER SERVICE CARD

HEAVY DUTY SHIPPING

Air freight cases, Foam lined, Designs for any computer system, Custom cases, *FAST TURNOVER!*

	Air Freight Case	Local Transport Case
NEC 6 FG	$397	241
Dell 486 CPU & KB	298	197
Dell 486 Tower	402	250



1-800-882-7112 M/C/ • Visa **Fax 616-374-8686**
WESTERN CONTAINER & CASE, BOX 125, WOODLAND, MI 48897

CIRCLE 789 ON READER SERVICE CARD

ROM BIOS UPGRADES

• Support Windows 3.0/3.1 • Support 1.2 MB & 144MB Floppy Drives • User defined hard drive types • Support VGA • Novell & Netware compatible • Enhanced 101/102 keyboard • 100% IBM compatible • Complete documentation • DOS 5.0 • Latest Version • Complete set up in ROM • Free Intel Chip Puller

We are the oldest and largest BIOS upgrader in the world. Guaranteed lowest prices all the time.

• IBM	• AST	• Wyse
• Acer	• AMI	• Kaypro
• Leading Edge	• Micronics	• Compaq
• DTK	• Hyundai	• Everex
• Dell	• Sanyo	• Gateway
• Sperry	• Samsung	• Tandy
• Northgate	• Wells American	• Epson

AND MANY MORE

"SPECIAL OFFER"

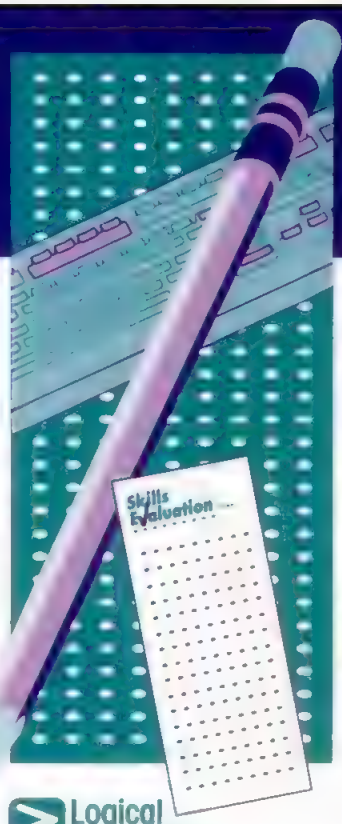
Get a FREE copy of PCSAFE™ utilities package with every order. Retail value $149.95

ORDER TODAY
1-800-800-2467
MA,FL,CA OFFICES

UNICORE SOFTWARE
1600 Turnpike St. • North Andover, MA 01845
(508) 686-6468 • FAX (508) 683-1630

CIRCLE 791 ON READER SERVICE CARD

Is the pressure on to justify how you spend your training dollars?



In these days of tight budgets, you need solid proof of the value of training.

That's why Logical Operations has developed the Skills Evaluation Series™ software-skills tests that you can use to assess basic software skills, screen to determine training requirements, and measure training effectiveness.

Each Skills Evaluation contains 20 multiple-choice questions with a manually or automatically scored answer card. Most evaluations are "hands-on," where students must be using the actual software and the sample files provided in order to complete the evaluation.

Fully validated, and designed to work with Logical Operations' classroom training materials (if you use them!), Skills Evaluations are available for most major software applications including, **Word for Windows, WordPerfect 5.1, Macintosh Orientation System 7, PC Literacy, 1-2-3 Release 3.1, Windows 3.1 Orientation, and Excel 3.0 for Windows.**

At only $78 for a Skills Evaluation Starter Package, you'll get an information-packed Administrator's Guide, answer key, and a 10 pack of tests. Additional 10 packs are available for $50.

Order now — it might prove to be the most cost-effective thing you'll do today. **Call 1-800-456-4677, ext. 40 to receive a FREE evaluation,** and prove the value of your training today.

Skills Evaluation Series™

Logical Operations
Learn from us

Skills Evaluation Series is a trademark of Logical Operations. All other copyrights are trademarks or registered trademarks of their respective owners.

AmRam — LOW WAREHOUSE PRICES!

1MB SIMM 70ns $40 4MB SIMM 80ns $149

TYPE	PKG.	100ns	80ns	60ns
256K x 4	DIP	$4.95	$5.25	$5.35
1M x 1	DIP	$5.22	$5.99	$5.99
256K x 9	SIMM	$8.99	$10.50	$12.99
		80ns	70ns	60ns
1M x 9 3 chip	SIMM	$40.00	$40.00	$43.00
1M x 9 9 chip	SIMM	$49.00	$51.00	$52.00
4M x 9 9 chip	SIMM	$149.00	$152.00	$159.00
1M x 36 72pin SIMM			$169.00	
4M x 36 72pin SIMM			$679.00	

MATH CO-PROCESSORS/CPUs

80387-SX	16-25	INTEL	$74.95
80387-DX	16-33	INTEL	$79.95
83SX87	16-25	CYRIX	$56.47
83DX87	16-33	CYRIX	$63.52
83D87-40		CYRIX	$73.00
OOP486-DX2	66MHZ	INTEL	$529.00
OOP486-DX2	50MHZ	INTEL	$359.00

CACHE MEMORY NOW IN STOCK!

408-559-0603

FAX 408-559-0301

2059 Camden Ave., #330 San Jose, CA 95124

All warehouse 100% guaranteed. We accept VISA, MC, Discover, CODs and company P.O's with prior approval. Prices, delivery and warehouse subject to change. Minimum order $100. Software require RMA, non-defective returns subject to a 15% restocking fee.

EXCEL INTRODUCES

DESKTOP DEMON
486SX - 25
210 MEG hd...4 MEGS ram
14" SVGA Color Monitor
3.5 & 5.25 Floppy • 101 Keyboard
Mouse • Mini-Tower Case
DOS 6.0 & Windows 3.1
2 Years Warranty (Parts & Labor)

$1,099.00

(609) 653-9595

AMERICAN EXPRESS · VISA · MasterCard · DISCOVER

Excel Computers

SEND $2.00 FOR OUR CATALOG:
P.O. Box 706 Abseconn, N.J. 08201
Laurel Dr. Somers Point, N.J. 08244

CIRCLE 553 ON READER SERVICE CARD

The ultimate machine travels at the speed of *light*. Our CREST machine is only a nonosecond away.

Virtual reality, advanced voice recognition, speech synthesis, full spectrum sound wave manipulation and movie video editing are just a few of the choices available.

FIELD TECHNOLOGY, INC.

RIPPLE WAVE CREST

From the people who design systems for the experts.

Voice (203) 761-9363
FAX (203) 761-9358
BBS (203) 761-9368

CIRCLE 551 ON READER SERVICE CARD

CORPORATE, GOVERNMENT, AND INTERNATIONAL Buyers

LOW PRICE, FAST SERVICE

TEL: (415) 861-8330
FAX: (415) 861-8380

GET OUR CURRENT PRICE CATALOG PROGRAM WITH 25,000 ITEMS!!

COMPUTER QUICK

186 6TH ST., SUITE 100, SAN FRANCISCO, CA 94103

80MHz !

The fastest 486 available!

Full 3 year warranty.

486 DX/80 MHz Vesa Local Bus.....$2,995

256K Cache, 16MB RAM,340MB IDE,Dual Floppies, 2 S, 1P, 1G. VGA Windows Accelerator 1MB on VL-Bus, SVGA 15"color monitor 1024x768 .28mm non-interlace, 101-key Keyboard, MS-DOS 6.0, Windows 3.1. +Mouse.

XYLON

Custom Systems built right for your needs... right now!

All systems FCC class B approved

199 LaFayette Drive
Syosset, NY 11791
(516) 921-0900

Call: (800) 883-0900
Fax: (516) 921-0977

CIRCLE 555 ON READER SERVICE CARD

THE NEW PC MAGAZINE CLASSIFIED FORMAT GIVES YOU MUCH MORE FOR FAR LESS...

New Flexible Ad Sizes
More Color Options
Lower Cost-per-Inch Rates

Call your PC Magazine Marketplace account representative today at:

1-800-825-4237

and let the new Classified work for you.

486

50/66 MHZ motherboards* & systems from

$228

***MADE by IBM**

3 YEAR WARRANTY

15 Days Money Back Guarantee

For immediate information, call (718) 335-9725 from your fax.

Fulmark Corp. 73 Spring St.,#407
NY, NY 10012

Tel. (800) FULMARK
Fax (212) 274-0803

CIRCLE 554 ON READER SERVICE CARD

Wanted: Used PCs!

We'll pay you cash for the following brands of used PC equipment:

IBM • Compaq • Apple
AST • Hewlett Packard
Any brand of Notebook/Laptop

Call for a free quote.

We don't buy brands other than those listed above!

We also sell refurbished PCs at discount w/1-year warranty. Call for current pricing!

Call 800-545-2313

RENTEX — We're in the NYNEX Yellow Pages

Quality & Service Since 1980

CIRCLE 556 ON READER SERVICE CARD

Kodak Portable Ink-Jet
Diconix 180si—NEW! **$179**
192dpi • small: 2 x 7 x 11"
Model 701 (300 dpi, 5 lbs.) $259

386 Pen Notebook
NCR 3125 5/20MB HDD **$299**
2MB RAM • VGA • NEW!
PenDOS, $50 • Windows for Pen, $100

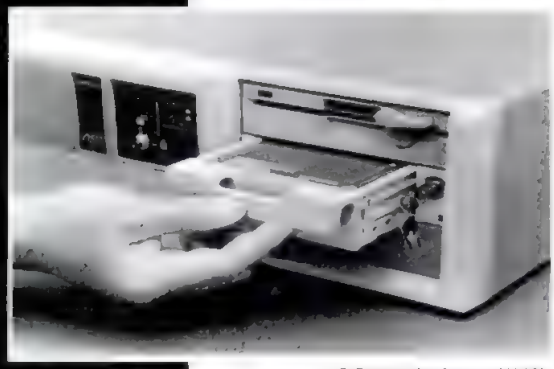
700MB Tape Backup System
Cipher QFA-700 **$199**
QIC-02 card, software • recert.

NEC External CD-ROM Reader
InterSect™ CDR-74
MultiSpin™ • 280ms seek **$299**
NEC Recertified

JEM COMPUTERS, INC.
(617) 497-2500
Fax: (617) 491-1008
CAMBRIDGE, MA

CIRCLE 552 ON READER SERVICE CARD

CRU DataPort™



Simply the best!

U.S. Patents 4,941,841 and 308,052

Removable Storage Module

Accepts standard 3.5" hard disk drives

- Versions for MFM/RLL, SCSI, and IDE
- Use in a variety of CRU and other enclosures
- "Ruggedized" for high reliability
- FCC verification

SECURITY/PORTABILITY/BACKUP

Remove your hard disk to prevent theft or unauthorized use. Transport your disk easily from one host computer to another. Store "ready-to-run" backup in a secure location.

Features the same rugged and reliable removable data storage unit used in the new CRU DataRAID™ fault-tolerant disk array system.

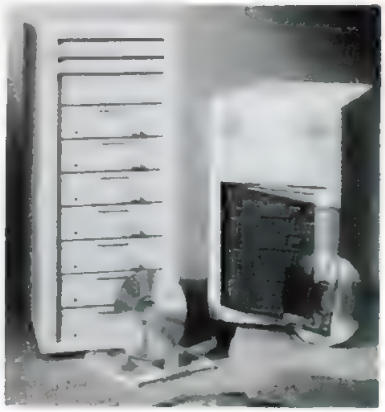
CRU Distributors: Tech Data, Gates/FA, C.B.C., D.S.S., Comstor, Arrow Electronics, Mini Micro.

CRU CONNECTOR RESOURCES UNLIMITED, Inc.
Tel: 408-957-5757 • Fax: 408-942-0862

CIRCLE 557 ON READER SERVICE CARD

CD-ROM *Mini Tower*

These CD-ROM towers are configured with high performance, double speed Texel CD-ROM drives. Texel drives are recognized globally for their superior data transfer rate and access speed. They resist their environment contamination; feature dust proof construction; are CD-XA ready; Kodak Photo CD Multisession compatible and are SCSI-2 compliant.



Boffin Towers come with...

- Internal SCSI cabling
- Mounting rails
- CD caddies
- External SCSI cable
- One year limited warranty

Network Ready 4 Bay Towers *starting as low as* **$2595.00**

Featuring COREL Network Manager with CD-ROM Network Loadable Module (NLM)

COREL SCSI! APPROVED PRODUCT

4, 5, 6 and 7 Bay Models available
Can also be configured with
Toshiba CD-Rom Drive at additional cost

BOFFIN LIMITED

612-894-0595
FAX: 612-894-6175

2500 W. COUNTY RD. 42 • #5 • BURNSVILLE, MN 55337

CIRCLE 558 ON READER SERVICE CARD

PENTIUM – 60 MHz

Since 1985, MSE has been dedicated to bringing you high-quality American designed, engineered and built computer systems for a wide range of applications. Now, for our 9th anniversary special, we are proud to introduce our fastest and most powerful machine. The Pentium – 60/66 MHz.

Low Cost Intel 486SX-25 MHz VLB $695

- Mini-Tower Case, 32 Bit CPU
- Upgradeable to DX2-66Mhz
- 4 MB RAM, expands to 32 MB
- 125 MB Fast Drive (15ms)
- 1.44 MB Floopy Drive
- 2 Serial/Parallel
- Enhanced Keyboard
- 128k Write Back Cache
- 33Mhz add $75

Orchid VL 486DX-33 MHZ

- 80486DX-33 CPU, 4MB RAM
- 1.44MB Floppy Drive
- 210MB Fast Drive (12ms)
- 128k Cache
- Enhanced Keyboard
- 50MHz DX2 add $100
- 66MHz DX2 add $200

$995

MicroCache 486 EISA - 33MHz

- 80486DX-33 CPU, 4MB RAM
- 1.44MB Floppy Drive
- 340MB 12ms Hard Drive
- 128k Cache, Pentium ZIF VLB
- 50MHz DX2 add $100
- 66MHz DX2 add $200

$1295

PC MAGAZINE

Motherboard Special

- 486SX-25MHz w/4MB RAM $399
- 386-33MHz w/128k Cache/4MB RAM $349
- 486-33MHz w/128k Cache/4MB RAM $599
- 486-50MHz DX2 w/128k Cache/4MB RAM $699
- 486-66MHz DX2 w/128k Cache/4MB RAM $799
- 486 PCI-66MHz w/128k Cache/4MB RAM $999
- 486 EISA-66MHz w/128k Cache/4MB RAM $999
- Pentium-60MHz w/512k Cache/4MB RAM $2099

Power PC Pentium P5-60 MHz

- Mini-Tower Case, 64 Bit CPU
- 4MB RAM, 512k Cache
- 525MB 10ms Hard Drive
- 1.44MB Floppy Drive
- Enhanced 101 Keyboard

$2795

Hard Disk SCSI-II

- Micropolis 3.0GB MC-1936 $2499
- Micropolis 2.0GB MC-1924 $1999
- Micropolis 1.7GB MC-2217 $1299
- Toshiba 1.0GB $799
- Quantum 525MB $549
- Maxtor 340MB $349

CD & Multimedia SCSI/NT Compatible

- NEC CDR-84 JD-1 $399
- NEC SCSI Host Adapter $99
- NEC CDR-74-1 $599
- Adapter VL-SCSI II $299
- Pro Audio Spectrum 16 $159
- Toshiba CD-3401 200ms $399

VESA Local Bus

- Orchid 486DX2-66MHz VLB w/4MB $799
- Micronics 486DX2-66MHz VLB w/4MB $999
- Orchid S3 VLB 1MB $149
- ET-4000 W 32 VLB 1MB $129
- Weitek P9000 VLB 2MB VRAM $399

PCI Local Bus

- PCI 486DX-33MHz w/4MB $799
- PCI 486DX2-66MHz w/4MB $999
- PCI S3 w/1MB $169
- PCI motherboard includes: PCI IDE/SCSI/16550 UART on board

Sales Hours:
Monday - Friday
9:00 AM - 5:30 PM
Saturday
10:00 AM - 3:00 PM
PST

Prices subject to change w/o notice.

MS ENGINEERING, INC.

10601 S. De Anza Blvd., Suite 214, Cupertino, CA 95014
(408) 257-4249 FAX: (408) 257-4398

486, 386 and SX are trademarks of Intel Corp

CIRCLE 559 ON READER SERVICE CARD

The Complete POS Solution

Hardware/Software Systems

Complete system starts at $1,499 (computer in register).

MTI's Watchdog Series
Big Shop Power at Small Shop Prices

STARTING AT $99

What Sets MTI Apart?

- Eleven years' POS experience
- Award-winning software
- Aggressively responsive support
- Flexible with broad options

MTI has everything you need to get as computerized as you want, and NOW it's affordable. Our award-winning systems are operating in thousands of retail stores and have been for eleven years. That experience means everything to you. It also means quick and capable technical support. For scanning, inventory, POS, purchasing/receiving, layaway, special order, check out MTI's Watchdog Series.

DEALERS: We have the most aggressive dealer program around

MTI
9055 Comprint Court
Gaithersburg, MD 20877

Call now to begin saving
800 433-4POS (4767)
(301) 948-8800 • Fax (301) 948-9125

CIRCLE 559 ON READER SERVICE CARD

BIS Quality Products Competitive Prices

WEDGES - For all PCs, Mac. RS-232... program w/bar code menu; data appears as keyboard input; reads all bar codes. Supports barcode & mag stripe scanners, incl. wand & print utility $249. Five year warranty. Made in USA.

PORTABLES - 2-4 x 16 LCD. 64K-256K, built-in generator for easy setup. Programable in C. Supports all bar code scanners. $650 +

MAG STRIPE ENCODER/ READER SYSTEMS (1, 2 or 3 tracks). $1099 +
Lifetime Tech Supp. Dealers Welcome. Spanish Dept Avail. 30 day $ back Direct from Manufacturer

BARCODE INTERNATIONAL SYSTEMS
(800) 653-4252
12140 Severn Way, Riverside, CA 92503
Tel: (909) 270-0016 • FAX (909) 270-0920

CIRCLE 562 ON READER SERVICE CARD

Now You Can LAN Bar Code Solutions!

New LANpoint® PC's

- Simple application development with DOS-based tools
- Connect directly to NetWare®, LANtastic®, LAN Manager, and TCP/IP Networks
- Built-in bar code and mag stripe capabilities
- Select from three package designs:
  - Compact size: 9.0"W x 5.0"H x 1.5"D, 1.7 lb.
  - Heavy-duty FACTORYpoint™ resists water, chemicals, and dust
  - TIMEpoint™ for Time & Attendance/Access Control features built-in badge reader

BURR-BROWN® BB
LANpoint Systems® Division

yes It runs with NetWare

To receive your FREE copy of "Using Bar Codes on a LAN" or to learn more about LANpoint, call (800) DataLAN or fax (602) 741-4245.

LANpoint®, FACTORYpoint™, TIMEpoint™, LANpoint Systems®, Burr-Brown Corporation, NetWare®, Novell, Inc., LANtastic®, Artisoft, Inc. Developer Tested Only. Novell makes no warranties with respect to this product

CIRCLE 560 ON READER SERVICE CARD

BAR CODE
Software for Windows

- Easy-to-Use
- True Graphics - Not a "Font"
- Paste Into Any Windows app.
- Full DDE Support
- Rotation. Text. Color
- Fully Scalable. •WYSIWYG
- 90-Day Guarantee

Only $199. Call for Info.
800 SCAN 004
Code 39, 128, 93, UPC, EAN, 2of5, Postal Codabar, PDF417, etc.. 17+ Symbologies

TAL
T.A.L. Enterprises, 2022 Wallace St. Philadelphia, PA 19130. (215) 763-2620

CIRCLE 563 ON READER SERVICE CARD

ITS **Your One Stop Source for Bar Code Solutions** ITS
Quality • Performance • Value

Low Cost Software Reader NEW!

- Eliminate external box with decoding software.
- No power supply needed for notebook/ laptop.
- Windows, RS- 232 and PC Wedge Version.
- Applications include: Field Sales/Order entry and inventory, document tracking and shipping and receiving.

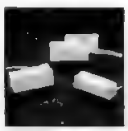
Select the Scanner You Need

- All types, configurations, sizes.
- Largest selection of Hewlett-Packard wands available.
- Lasers, CCD, slot, wand and POS/Retail Table-Top scanners. NEW!
- HP wands with built-in decoders.

Easy-to-Use Labeling Software

- For all dot matrix, laser, and bar code printers.
- Available for Windows and easy to use.
- Suppliers of Zebra and Sato bar code printers.

NEW! **Low Cost, High Performance, Compact Magnetic Stripe Readers**



- Versatile: Tracks 1,2,3.
- Bi-directional and durable.
- Excellent for retail and industrial usage.
- RS232 and PC Wedge versions and encoders.

Value Packed Portable Terminals NEW!

- Easy to upload data and to program.
- MS-DOS compatible terminal available.
- Multi-memory options, battery backup.
- Applications include: Inventory Control and Retail/point of sale.
- Programmable as a printer driver.

Bar Code Readers for IBM Compatibles, Mac, RS-232, Network Industrial Terminals, DEC, WYSE, IBM, HP, and other Hard-to-Find Interfaces

- Plug and play. • Easy Setup.
- No software needed.
- Multi-input versions available.

Call About Our 30 Day Money Back Guarantee! Variety of Payment Options! • Toll Free Technical Support! Next Day Delivery! • Over 100,000 Satisfied Users! Technical Support! Full 2 Year Warranty on Readers and Wands!

International Technologies & Systems
9201 Forest Hill Avenue, Suite 108, Richmond, VA 23235 • 655K No. Berry St., Brea, CA 92621
CALL US! Eastern USA (800) 826-1688 • Western USA (800) 228-9487
International Call (804) 272-0138 • FAX (804) 272-0357 • (714) 990-1880 • FAX (714) 990-2503

CIRCLE 561 ON READER SERVICE CARD

BAR CODE PRINTING AND READERS

BEAR ROCK MEANS BAR CODES
1(800)232-7625

- Bear Rock Labeler™ for Windows. ™ Label and envelope design software with full bar code support.
- PrintBar.™ Precision bar code fonts for Macintosh™, Windows ™ or OS/2.™
- Printbar II.™ DOS memory-resident bar code printing program for PC's.
- CodeScan.™ Bar code readers. 30 day evaluation, 5 year warranty.

Ask about special discounts!
1-800-232-7625

Bear Rock TECHNOLOGIES
4140 Mother Lode Drive • Shingle Springs, CA 95682
(916) 672-0244 • FAX (916) 672-1103

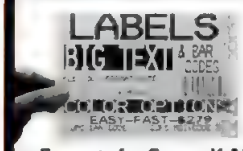
Bar Code Headquarters

Offices in USA and Europe!

Labeling Software

For Dot Matrix or LaserJet

Windows Version!



- Any Format, Any Size Label
- WYSIWYG or Text Design
- Easy, Powerful
- **Formats for Sears, K-Mart, Penney's, WalMart, TCIF, Logmars, AIAG, etc.**
- Bar Codes: UCC-128, UPC/EAN, 2of5, MSI, 11, Codabar, Code 128, and Code 39
- Big Text and PCX Graphics too!
- Powerful, Versatile, Easy to Use
- Imports ASCII data files from dBase, etc.
- LabelRIGHT™ for Windows – **$379**
- Above Label Printed by LabelRIGHT™ – **$279**

Thermal Transfer Printer with Labeling Software

- Fargo's Allegro Thermal Transfer Printer
- Up to 4" label width
- Small size, only 20 lbs.
- Prints UPC/EAN, 2of5, Codabar, 128, Code 39
- Prints scalable text and PCX graphics
- Packaged with LabelRIGHT Thermal software, serial cable, ribbon and labels
- Complete package, ready to use – **$ 1895**

Portable Bar Code Readers

for PC,XT,AT,PS/2,Macintosh, and Serial Interface Computers

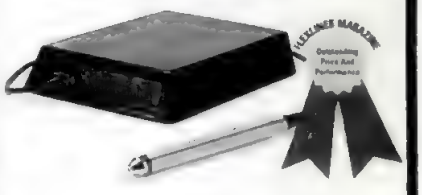
With Voice!

- Battery Operated Reader — 64K or 256K
- Kybd or Serial upload
- **Optional voice messages tell operator what to do at specified errors and at data entry steps. Messages are pre-recorded by microphone and broadcast thru built-in speaker or earphone. EASY! Any language.**
- Wand, CCD or Laser Input
- UPC/EAN, 128, 2of5, MSI, Code 39, etc.
- Real Time Clock for date/time stamps
- Double duty as Non-portable Reader
- **Very Easy to Program!** Custom Prompts.
- Complete 64K unit with Wand – **$799**
- 256K Unit with Wand and Voice– **$999**

Bar Code Readers

for PC, XT, AT, PS/2, Mac and RS-232 Terminals

New RF Wand



- Attaches as 2nd Keyboard
- UPC/EAN, Code 128, 2of5, MSI, Code 39
- Wand, Magstripe, CCD, Slot Badge or Laser
- All European Keyboards Supported
- Superior Read Rates. Made in USA.
- **Top Rated by Independent Reviews**
- Complete with Laser Scanner – **$1295**
- Complete with **Cordless** RF Wand – **$495**
- Complete with Corded Steel Wand – **$399**

Ordering is Easy!

Call for our Free Catalog

- **Made in the USA**
- **Free "800" Support**
- **Qualified P.O's Accepted**
- **2 Year Warranty on Readers**
- **Same Day Shipping**
- **Free UPS Blue in US**
- **30 Day Money Back Guarantee**

In US or Canada Call Toll Free

800-345-4220

In Europe call information for Toll Free numbers to our Swiss Office

Swiss Office:
Rütistrasse 6
9050 Appenzell, Switzerland
71 87 51 17 Fax • 71 87 51 15

US Office:
3004 Mission Street
Santa Cruz, CA 95060
[illegible]

WORTHINGTON
DATA SOLUTIONS

THE BARCODE LEADER DOES IT AGAIN...

KEYBOARD WEDGE SOLUTIONS!

HAND-HELD LASER GUN $895

FREE BARCODE PRINTING/CREATION SOFTWARE WITH LASER PURCHASE

STAINLESS STEEL WAND $279

800 TECHNICAL SUPPORT
30 DAY MONEY BACK GUARANTEE
SAME DAY SHIPPING
2 YR LASER SCANNER WARRANTY

DATAVISION
30 INDIAN DR., IVYLAND PA 18974
10421 BURNHAM DR GIG HARBOR WA 98335

1-800-486-0620 EAST COAST
1-800-486-9585 WEST COAST

CIRCLE 564 ON READER SERVICE CARD

AUTOMATE Your Business ...With Point of Sale

BASIS™ (Since 1987)
POINT-OF-SALE & INVENTORY CONTROL

- Affordable & Easy to use
- Amazingly powerful software
- Your solution for customer tracking, inventory control & reports
- Easy integrated with scanners, cash drawers, receipt printers, barcode printers & portable readers
- We provide the Hardware, Software solutions
- Nationwide Technical support provided

Valencia Computers
28009 Avenue Crocker, Valencia, CA 91355
(805) 294-6313
***M/C & Visa ***Easy Financing

CIRCLE 565 ON READER SERVICE CARD

BAR CODE EXPERT

IBS

- Keyboard wedge readers for PC, XT, AT, PS/2, Mac, Terminals. No software change required
- Readers w/RS-232, RS-422, DTMF output and multidrop protocol
- Reads UPC, EAN, Code 39, 11, 128, Interleaved 2 of 5, Codabar, MSI
- Wand, Slot, CCD, Laser, Magstripe
- Reader w/steel wand - from $298
  Bar code labeling S/W - from $99
- Direct from manufacturer
- 30 day money back guarantee
- Reseller's Discount available
- **Fingerprint verifier**
- Please call for free catalog

800-765-2271

IBS-Intelligent Barcode Systems
16031 Kaplan Ave., Industry, CA 91744
Tel.818-968-6265 · Fax:818-968-5527

BAR CODE READERS

AMERICAN MICROSYSTEMS

2190 Regal Pkwy. • Euless, Texas 76040 • (817) 571-9015

FOR PC, XT, AT, PS/2 & TERMINALS:

- No software changes required
- Data appears as keyboard input
- Reads Code 39, I-2of5, UPC/EAN, Codabar 11, 93, 128, MSI/Plessey
- Auto-discriminates between codes
- Accepts WAND, SLOT, MAG STRIPE, CCD, LASER
- Easy To Use

MAG STRIPE

SLOT (BADGE)

WAND

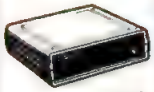
LASER

CCD

METRO LASER

BAR CODE PRINTING SOFTWARE:

- For Epson, OKI, IBM, Dot Matrix and HP LaserJet Printers
- Prints Code 39, I-2of5, UPC/EAN, Codabar, 128, 93, 11, MSI/Plessey


DECODER BOX

PORTABLE READERS:

- Use as a portable, wedge or terminal
- Input Devices: WAND, CCD, or 5V LASER
- Real-time clock for date and time stamps
- Automatic power off with resume
- "Built-In" Inventory programs
- 54 key alpha/numeric keyboard
- Supports HAYES compatible modems

(800) 648-4452 • FAX: (817) 685-6232
30 Day Money Back Guarantee
One Year Warranty

Full Featured 9-Tracks

& 3480 Cartridge Drives

Super Software & Support

Exceptional Speed & Reliability
Auto Threading/Loading
SCSI

PC 286/386/486
SUN/IBM/HP WORKSTATIONS

800/842-0708
HAUPPAUGE, NY 516/273-5900

TDX PERIPHERALS

The Only Professional Choice

CIRCLE 566 ON READER SERVICE CARD

VIKING DATA ENTRY

Professional Quality Software makes your difficult data entry jobs easier.

Viking Customer Care insures you a quick easy conversion to VDE.

For PCs, UNIX and VMS.

Call for free preview
800-324-0595

Ph: 918/491-6144 • Fx: 918/494-2701
In UK: 0937-588056 • Fx: 0937-588059

VIKING

Viking Software Services, Inc.
1808 E. 67th Street, Suite 100
Tulsa, Oklahoma USA 74136-4959

PC MAGAZINE INDEX

1993 – $15
1992 – $14
1991 – $13
1990 – $12

PC-NDX is a disk-based keyword index to *PC Magazine*. The 1993 edition includes over 14,000 keywords which index the entire contents of all 22 issues of *PC Magazine*. A powerful search program displays citations which include the article title, description and page number. The 1994 edition is available on a quarterly, semi-annual or annual basis. Shipping & handling is $3.00 per order

PC ndx

PC-NDX
P.O. Box 1714
Mishawaka, IN 46546-1714
(219) 256-1045

CIRCLE 567 ON READER SERVICE CARD

Press 1 for sales, 2 for service, 3 for a live operator

Voicemail Cash Machine

Make thousands of dollars effortlessly by installing our voicemail in your 286/386. Use it to answer your home office phone, rent pocket-pagers, advertise products or operate a pay-per-call service using credit cards, passwords or a 900#. Systems start at $295.

Call 24 hours: **800.283.4759**
Int'l & Demo line: 818.718.9560

DemoSource™
The Voice Application Superstore
8345 Reseda Bl, Ste 202
Northridge, CA 91324 USA

CIRCLE 569 ON READER SERVICE CARD

HARD DRIVE WHOLESALERS

OTHER DRIVES IN STOCK CALL NOW!

261MB IDE $229

CONNER IDE DRIVES

CO-30174	170MB	17ms	$195
CP-30254	251MB	14ms	$233
CP-30544	540MB	10ms	$643

QUANTUM SCSI DRIVES

PD-1275	127MB	17ms	$189
PD-2405	245MB	16ms	$258
PD-525S	525MB	10ms	$659
PD-1225S	1.22GB	10ms	$1,085

SEAGATE IDE DRIVES

ST-3243A	214MB	16ms	$211
ST-3144A	131MB	16ms	$179
ST-3290A	261MB	16ms	$229
ST-3550A	452MB	12ms	$435
ST-9100A	85MB	16ms	$223*
ST-9145A	127MB	16ms	$288*

**2.5" drives

SEAGATE SCSI DRIVES

ST-11200N	1.05GB	10ms	$923
ST-12400N	2.1GB	9ms	$1641

408•559•1773 FAX: 408•559•0823
2959 Camden Ave, #333 San Jose, CA 95124

All drives 100% guaranteed. We accept VISA, MC, Discover, COD's and company PO's with prior approval. Prices, delivery & manufacturers subject to change. Returns require RMA; non-defective returns subject to a 15% restocking fee

---

The Mail Order Wizard™

Everything you need to manage your growing phone-order or mail-order business.

- Order processing
- Mail list management
- Electronic charge processing
- Inventory control
- UPS manifest
- Financial reporting
- Ad forecasting

Winner of *Home Office Computing*'s General Excellence Award

Systems start at $695
Call for free info or $20 demo.

The Haven Corporation
1227 Dodge Ave., Suite M93
Evanston, IL 60202-1008
800-676-0098 or 708-869-3553

CIRCLE 568 ON READER SERVICE CARD

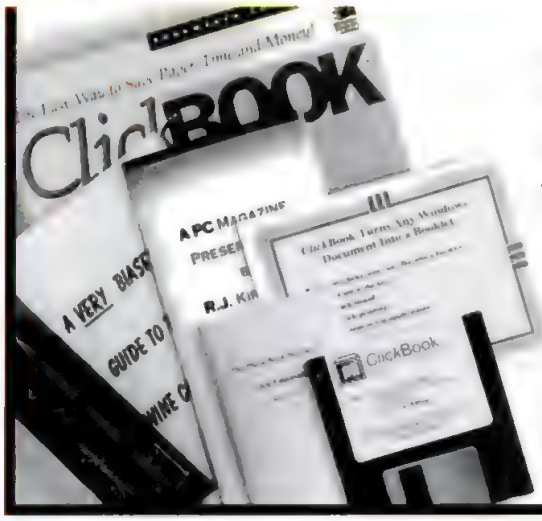
America's most popular, most complete, and most affordable solution for the mail order business—order entry/review, credit card processing with dealt capture, UPS manifesting, profit analysis, accounting, telemarketing, list management. Clipper compiled, dBase III + files. Single and Multi-user versions. Find out why more people buy MOM after comparing!
Demo kit $25 refundable deposit.

MailOrderManager™

Dydacomp Development Corporation
150 River Road, Suite N1, Dept. PCM
Montville, NJ 07045
1-800-858-DMOM
201-335-1056

CIRCLE 570 ON READER SERVICE CARD

To turn ANY Windows document into a handy booklet, just click, staple, and go!



Turn a 24 page report into a 6 page booklet. Transform pages of addresses into a pocket sized directory. Print manuals, programs, cookbooks, and more. *Click*Book™ makes it a snap!

Just click and *Click*Book lets you select one of 18 styles, then it sets it all up, and even shows you how to print and staple.

*Click*Book saves time, money, and paper. And it makes your Windows documents a pleasure to read.

The experts are raving about *Click*Book.

"The most useful utility I've seen in months. It turns virtually any document created by a Windows application into a neat little booklet."
– Jim Seymour, PCWEEK, 8/9/93

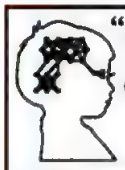
"For saving paper and making virtually any kind of document easy to handle, *Click*Book is a great utility that's stunningly easy to use."
– PC Magazine 11/23/93

BookMaker

Make your documents look like a million for just **$69.95**

Call 1-800-766-8531 to order *Click*Book or (415) 617-1101 to find out more.

CIRCLE 571 ON READER SERVICE CARD



"BrainMaker is the most fascinating computer software I've ever seen."
- John Dvorak
PC Magazine

Save money, make predictions, increase productivity, improve quality, and more. No programming - - neural networks learn by example!

You can quickly solve hundreds of types of problems - from financial forecasting, medical diagnosis, business decisions to scientific and engineering problems.

America's favorite neural network!
- BrainMaker. $195
- BrainMaker Professional..... $795
- Genetic Algorithms (GTO).....$275

30 day guarantee. FREE brochure:
(800) 284-8112 or (916) 478-9040

California Scientific Software
10024 Newtown Rd, Nevada City, CA 95959

CIRCLE 572 ON READER SERVICE CARD

THE DATA ENTRY SOFTWARE SYSTEM FOR PCs

KeyEntryIII®

Announcing Version 6.0!!

- Completely revised and redesigned documentation
- Totally new user interface
- New pull down menus, windows, and dialog boxes
- Powerful editing capabilities
- Enhanced data formatting capability
- Upgradable to ImageKey™ for image-assisted data entry

Call 800-533-6879 for more information!

SCS Southern Computer Systems, Inc.
205-251-2985 ■ FAX 205-322-4051
In UK: SCS Europe Ltd.
0753-536550 ■ FAX 0753-536765

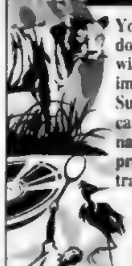
B.S. & M.S.
In Computer Science

- ALL COURSES HOME STUDY
- Approved for tuition reimbursement by leading corporations
- Increase your earning power
- Join students from leading computer companies
- Ada and C++ courses available

FOR FREE INFORMATION CALL 1-800-767-AICS or 1-205-323-6191

AMERICAN INSTITUTE OF COMPUTER SCIENCES
The leading edge of learning

IMAGES WITH **Impact!** Vol. I *FOR WINDOWS*



Your presentations and documents will come alive with over 1,000 high-impact WMF graphics. Subjects include: business, cartoons, food, healthcare, nature, people, sports, presentation helpers, travel and more!
Available on disk and CD-ROM.

FREE T-shirt and 20 True Type fonts!

$79.95 Suggested Retail $119.95

Special Offer

1-800-456-0234
ext. 42 Toll-Free Order Line

CIRCLE 577 ON READER SERVICE CARD

CHURCH SOFTWARE

Discover for yourself why more churches are choosing **Power Church Plus.®**

Try out the leading membership and accounting package.

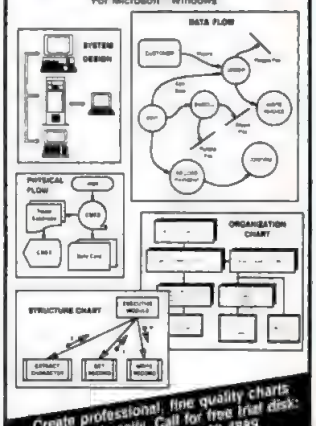
Call today for your free full-working Demo.

F1 SOFTWARE,
208 Ridgefield Drive,
Asheville, NC 28806

(800) 486-1800

CIRCLE 573 ON READER SERVICE CARD

RFFlow
Professional Flowcharting
For Microsoft® Windows



Create professional, fine quality charts quickly and easily. Call for free trial disk: (303) 663-5767 FAX (303) 669-4889

$129.00

RFF ELECTRONICS
1063 Banyan Court, Loveland, CO 80538

CIRCLE 574 ON READER SERVICE CARD

Slide Imagers®

Overnight
$4.95 Slides & Canons
Digital Output

- Slides/Overheads
- Dye Sub Output
- Large Color Posters
- Canon Fiery Lasers
- Slide Duplication
- 4x5 Neg/Pos/B&W

Photo CD™
Scans $.90
(800) 232-5411

CIRCLE 576 ON READER SERVICE CARD

THE NEW PC MAGAZINE CLASSIFIED FORMAT GIVES YOU MUCH MORE FOR FAR LESS...

New Flexible Ad Sizes
More Color Options
Lower Cost-per-Inch Rates

Call your PC Magazine Marketplace account representative today at:

1-800-825-4237

and let the new Classified work for you.

CD-ROM PRICE CLUB

- IT'S A WONDERFUL LIFE THE ENTIRE MOVIE $19
- IMAGES OF NASA PAST PRESENT & FUTURE $29
- THE WAVE POOL WAV FORMAT SOUND CLIPS $19

*DRACULA $49
*GRANDMA & ME $39
*LORD OF THE RINGS $49
*RETURN TO ZORK $49
*INDIANA JONES $45
*DAY OF THE TENTACLE $45

MANY CD ROM TITLES UNDER $10

DESKTOP PUBLISHERS DREAM DISC
OVER 500 FONTS &
1000'S OF PIECES OF CLIP ART
+++ 184 PAGE BOOK+++
$29

PIER SHAREWARE VOL. 3
640 MEGS OF DATECHECKED FILES
BBS READY. $29
WIN PLATINUM******* BROWSE IN WINDOWS FOR YOUR WINDOWS SHAREWARE $19

PANASONIC $69 DUBL SPEED ROM DRIVE $249
$20 CREDIT TOWARD PURCHASE OF ANY TITLE

JD EXPRESS inc
For Your CD Roms
335 Nassau Rockaway Ave Bellmore NY 11710
TEL. 516-563-0617
FAX 516-563-0618

CD-ROM DRIVES

TOSHIBA, TEXEL & TEAC

SCSI INTERFACE
TRANTOR
MEDIA VISION

WIDE SELECTION OF CD-ROM TITLES
CD-ROM CADDIES & ACCESSORIES

COMPUTERS AT LARGE
Dedicated to CD-ROM Technology
Please Call for Our Price List

PH:(408) 255-1081 FAX:(408) 255-2388
800-642-4194
SARATOGA, CA

CIRCLE 580 ON READER SERVICE CARD

Interested in PC SECURITY..

CALL
(813) - 744-5177
FAX
(813) - 744-5197

EliaShim
MIRCOCOMPUTER INC.
4005 WEDGEMERE DRIVE
TAMPA, FLORIDA 33610

CIRCLE 582 ON READER SERVICE CARD

Key-Lok™ Security

- ☐ Fighting piracy since 1982.
- ☐ Algorithmic response
- ☐ Programmable memory
- ☐ Very economical
- ☐ Device transparent to PARALLEL /SERIAL port
- ☐ Multiple security layers
- ☐ Counters/Real-time clock
- ☐ Multiproduct licensing
- ☐ DOS/UNIX/VMS/etc

Access Control System

Diskette Drive Locks

Microcomputer Applications
3167 E. Otero Circle
Littleton, CO 80122
(303) 770-1917

FREE CD SOFTWARE BUYER'S GUIDE

Hundreds of titles reviewed. Free, up to the minute information available online: up to 9600 baud (415) 543-3343. CD-ROM version includes sample screens, only $4.95. To order your free CD Software Buyer's Guide, call:

800-223-9779

or order by fax: (415) 543-3532

CIRCLE 578 ON READER SERVICE CARD

HOME Organize!

At these value prices, you can afford to get organized!

DOS version was $34.95 NOW $24.95

WIN 3.1 version was $59.95 NOW $39.95

The Ideal Home Organizer!

- *Address Book*
- *Word Processor*
- *The Record Keeper*
- *Daily Planner*
- *Personal Journal*
- *Family Scrap Book*
- *Recipe Book*

Keep It All Organized on Your PC –at home, at the office, on the road!

Scarborough Enterprises, Inc.
2000 1st Ave. N.
Anoka, MN 55303
FAX (612) 427-9117
Phones Open 7AM – 7PM CST

CALL AND ORDER TODAY!
612•427•9100
Phones Open 7AM – 7PM
Dealer/Retailer Volume Discounts Available

SOFTWARE LABS

WORLD'S LARGEST SHAREWARE DISTRIBUTOR

Selected by IBM as a supplier for software testing.

See why IBM chose our professionally tested virus-free library.

Call TOLL FREE or write for our free world famous 92-page catalog with exclusive 12 BONUS DISK offer.

100 CORPORATE POINTE SUITE 195
CULVER CITY CA 90231

800-569-7900
FAX: 310-410-2044

CIRCLE 583 ON READER SERVICE CARD

UP FRONT Multimedia, Inc.

Complete Kits
TEXEL-TOSHIBA-SONY
w/ PRO-AUDIO 16 & SPKRS.
From $389.95
w/ 6 Top CD Titles
2 Year Warranty
VISA-M.C.-AMEX

CD-ROMS
100's of Titles
Best Prices!

IBM
MAC

Drives & Software
(800)923-7667 Toll Free
(818)782-3683/FAX(818)782-4411

Call for Free Catalog

SPECIALS
GROLIER'S V.1.5 MPC ENCY. $50
'92 COLLEGE HANDBOOK $9.95

CIRCLE 579 ON READER SERVICE CARD

PROTECT YOUR SOFTWARE TODAY

EVERLOCK 3.0

Software Solution

- ☑ OPTION BOARD SAFE
- ☑ CPU LOCK
- ☑ REMOTE REGISTRATION
- ☑ CD ROM LOCK
- ☑ MSDOS 6.0 & WINDOWS COMPATIBLE

with over 14 new features you have asked for over the years. If Software based protection is what you need, don't settle for anything less than EVERLOCK 3.0.

EVERKEY LOCKS & BUTTONS

Hardware Solution

We have combined the Versatility of Az-Tech Software and the **ONE WIRE** Hardware Compatibility of Dallas Semiconductor in the new **BUTTON** package. With It's PRICE advantage and added Flexibility, EVERKEY BUTTONS will lead us into a **dongleless** world.

As your partner in the fight against Software Pirates, Az-Tech is the only company that offers you these options in both a Software and a Hardware Solution:

•DATE & EXECUTION LIMITS• COMPRESSION •ENCRYPTION • SERIALIZATION• REMOTE RESET

These systems are easy to use and most importantly, they work! No other company can provide you the Compatibility, Flexibility, Ease of Use and Degree of Protection that you receive with all Az-Tech products.

Az-Tech Software, Inc.
LEADERS IN SOFTWARE SECURITY
201 East Franklin, Suite 11 Richmond, MO 64085
(816) 776-2700 FAX (816) 776-8398

Call Today For A Free Demo Disk
(800) 227-0644

CIRCLE 581 ON READER SERVICE CARD

A chain is as strong as its weakest link.

Picture your Hardlock™ key as a bike lock, and the accompanying software routines used to implement the copy protection as the chain. You can own the best lock that money can buy, but that lock is useless if the chain is weak.

Introducing **HL-Crypt**, a major breakthrough in copy protection. HL-Crypt is not just a shell or simple conditional response checker. Using our proprietary Patcher Technology, HL-Crypt encrypts and binds the application to your Hardlock™ device. HL-Crypt features many protection modules that secure the application against piracy, reverse engineering, and debugging, to name a few.

Picture HL-Crypt as an ironclad chain. The only ironclad chain in the industry today.
For more information, call
1-800-562-2543

The only product that combines fortified software encryption with the Hardlock™ family of copy protection devices for stand-alone and network implementations.

Made in the U.S.A.

HL-Crypt

The Fortified Protection Linker for Hardlock

GLENCO ENGINEERING INC.

Fax 708/808-0313

Contact us for the name of the distributor in your country.

CIRCLE 584 ON READER SERVICE CARD

SOFTWARE DUPLICATION

- Highest Quality Media
- Competitive Pricing
- 24 Hour Turnaround
- Total Quality Assurance
- Custom Labels & Packaging
- Sales and Service of: **DUPLICATION EQUIPMENT**

PRINCETON DISKETTE
800 426-0247
1101 RICHMOND AVE.•PT. PLEASANT BCH., NJ 08742

CIRCLE 587 ON READER SERVICE CARD

WE WROTE THE BOOK ON DISK DUPLICATION.

Call Us For Your Free Copy !

- *Diskette Duplication*
- *Packaging / Fullfillment*
- *Magnetic Media Testing*
- *Professional Mastering*
- *CD- ROM Development*
- *Fast Turn Around*
- *Great Prices / Flexible Terms*

MATRICS CORP.
1 - 800 - 747 - 0583
Rochester, New York

CIRCLE 588 ON READER SERVICE CARD

CONVERSIONS between Word Processors
CD-ROM mastering & duplication
DUPLICATION of diskettes/tapes
OCR SCANNING of documents

2500 Word Processing & Computer Formats, 3 1/2", 5 1/4", 8" DISKS, 9-TRACK, 3480, 8mm, 4mm, Colorado, Mountain, DC2120, TK50 TAPES, 1/4" Tapes, Syquest & Bernoulli Cartridges, Magcards.

Quality Media
Quickest turnaround
Guaranteed Satisfaction

COMPANY COMPENDIA, INC.
1-800-374-DISK
Ph: 312-419-8771 Fax: 312-419-1390

CIRCLE 585 ON READER SERVICE CARD

DATA CONVERSION

DISKS • TAPES • CARTRIDGES
CONVERSION-DUPLICATION-SCANNING
MORE FORMATS THAN ANYONE !

Quick • Reliable • Quality

WORD PROCESSORS, MINIS MICROS, SPREADSHEETS DATABASES, MAIL LISTS
IBM, DEC, APPLE, WANG HP, WordPerfect, MS-Word
Lotus Dbase MICOM LANIER CPT, NBI DISPLAYWRITER 8/4MM, XEROX, CP/M, UNIX ...

NATIONAL DATA CONVERSION
5 East 16th Street, New York, NY 10003
(212) 463-7511
AMERICA'S LEADERS IN DATA CONVERSION

CIRCLE 586 ON READER SERVICE CARD

DATA CONVERSION

If you want the most complete conversion services in the industry, just call...

(800) CONVERT

Capabilities include over 5000 formats

PIVAR COMPUTING SERVICES, inc.®
165 Arlington Heights Rd. #M
Buffalo Grove, IL 60089
(708) 459-6010

DUPLICATION EQUIPMENT

For-in-house duplication, MediaFORM is the source. We sell and service high-quality software duplication and labeling equipment. And we can tailor a complete, cost-effective system to meet your specific needs.

MediaFORM
800-220-1215
215-458-9200 (in PA) Fax: 215-458-9554
Exton, Pennsylvania 19341

PCMCIA Card Duplicator

- Duplicates PCMCIA 2.0/JEIDA4.1 (Type I, II, III) cards in all technologies (FLASH, SRAM, OTP, EEPROM, Mixed)
- Ultrafast! Copies 32x1Mb Flash cards in 13 seconds
- Software is Windows based with optional Touch Screen interface

D&C MICROSYSTEMS INC.

Tel: (408) 730-5511 Fax. (408) 730-5521

DON'T COPY . . . DUPLICATE

- Standalone & PC based units available
- Compact design
- Low maintenance
- Economically priced
- Expandable options to network the systems
- Fast——Up to 138 3-1/2 1.44MB
- One year limited factory warranty

Champion Duplicators, Inc.

Manufacturer of Ventuno Brand Floppy Diskette Duplicators

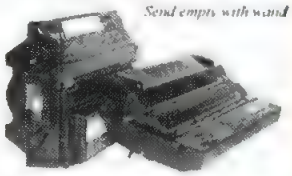
800-752-2145

CIRCLE 591 ON READER SERVICE CARD

TONER CARTRIDGES REMANUFACTURED

PRICES FROM $45 SHIP INCL.

Send empty with wand



TESTED - GUARANTEED - 24-HR TURN

HP, Apple, Canon, IBM, etc. Laser Cartridges
Canon/Sharp-Z/Xerox Drum Copier Cartridges

MICR Toner, Fonts, Software for Laser Check Printing
Color Toners for Canon and IBM engines
OPC Cartridges and Toner for almost all laser printers

1-800-239-4027
1-800-722-2804 (Atlanta)

ADVANTAGE LASER PRODUCTS, INC.

1929 Queen City Ave. Tuscaloosa, AL 35401
2030 Powers Ferry Rd STE 218 Atlanta, GA 30339

CIRCLE 594 ON READER SERVICE CARD

FORMATTED DISKETTES

5¼"360K	39¢	3½"720K	45¢
1.2mg	46¢	1.4mg	58¢

TAPES

2000	$11.00	2120	$15.50
6150	15.50	6525	22.50
4mm	11.25	8mm	10.25

SONY • BASF VERBATIM

Price per disk in lots of 300
Subtact .04¢ for unformatted DD.
Subtract .09¢ for unformatted HD.
Tapes in lots of 10. Mix and Match.

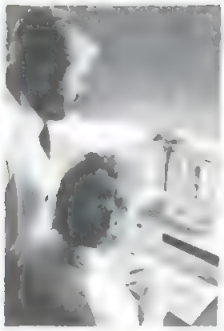
MEGAsoft

(800) 222-0490

FAX: (908) 462-5658
819 Hwy. 33E. Freehold, NJ 07728

CIRCLE 569 ON READER SERVICE CARD

Ontrack DATA RECOVERY



- PROFESSIONAL SERVICE - AUTHORIZED by Conner, Iomega, Maxtor, Micropolis, Quantum, Rodime, Seagate, Western Digital, & others.
- EXPERTISE in DOS, Novell, OS/2, Macintosh, Unix, Xenix, Banyan Vines, Sun, DEC, & Wang. Service also available on tape & removable media.
- ON-SITE, weekend, & priority service backed by 24-hour worldwide support.
- FOR FAST, SUCCESSFUL RESULTS call Ontrack, we can recover your data!

MN: 1-800-872-2599 • CA: 1-800-752-7557

U.K: 44-81-974 5522 • Germany: 0130-815-198

6321 Bury Drive, Eden Prairie, MN 55346 • 2400 Main Street, Suite 200, Irvine, CA 92714

HARD CASE PROTECTION

Your notebook won't feel a thing!

NB-4000	$179.95
NB-3000	$149.95
NB-1000	$59.95
	$69.95

1-800-475-0707
719-531-5535

DOUBLECASE

CIRCLE 595 ON READER SERVICE CARD

media source

SINCE 1986

DISKETTES

100% Guaranteed

PC Grade	Blank Formatted		High Grade O.E.M. Duplicator Bulk	Blank Formatted	
3.5 DS/DD	32¢	36¢	3.5 DS/DD	40¢	43¢
3.5 HD	46¢	52¢	3.5 HD	59¢	67¢
5.25 DS/DD	18¢	23¢	5.25 DS/DD	22¢	26¢
5.25 HD	24¢	29¢	5.25 HD	28¢	36¢

SONY/Verbatim Bulk

	Blank Formatted			Blank Formatted	
3.5 DS/DD	54¢	57¢	5.25 DS/DD	22¢	26¢
3.5 HD	90¢	96¢	5.25 HD	30¢	37¢

All 5.25 Include Sleeves, Prices per lots of 100
Lower on Higher Quantity

800•356•2553
FAX (404) 919•9228

CIRCLE 590 ON READER SERVICE CARD

DUPLICATION FROM $.49

HIGHEST QUALITY MEDIA

From $.49 (5.25") and $.80 (3.50")

- All Diskette Formats
- Custom Labels
- Diskette Mailers, Accessories
- Assembly, Shrinkwrap
- Generic [illegible]

FORMATTED DISKETTES

FORMATTED	QTY 250	BLANK
$.69	3.50" DS/HD	$.59
$.56	3.50" DS/DD	$.49

- FREE FORMATTING on First Order
- BASF, MEMOREX, VERBATIM
- SONY AVAILABLE [illegible]
- COLORED MEDIA Please Add $.05

800-255-3142

Diversified Systems Group, Inc.
PO Box 1114 Issaquah WA 98027

CIRCLE 592 ON READER SERVICE CARD

STOP THROWING AWAY TONER CARTRIDGES

Empty Cartridges Recycled
Guaranteed To Work Like New

From $36

FREE U.P.S. PICK-UP & DELIVERY

National Toner
Recycling & Supply

(800) 676-0749

CIRCLE 593 ON READER SERVICE CARD

SOFTWARE DUPLICATION

Disks and Tapes
Printing Services
Package Assembly
Fulfillment
In-Bound Tele-Sales

Introducing
CD-Rom Duplication

DUPLICATION EQUIPMENT

Autoloaders
Standalones
Labelers
Sleevers

MEGAsoft

(800) 222-0490

FAX: (908) 462-5658
819 Hwy. 33E. • Freehold, NJ 07728

CIRCLE 596 ON READER SERVICE CARD

BULK DISKS

SONY♦DYSAN♦VERBATIM

	QTY 250 BLANK	QTY 250 FORMATTED
5 1/4" DS/DD	.33	.39
5 1/4" DS/HD	.42	.54
3 1/2" DS/DD	.49	.59
3 1/2" DS/HD	.69	.79

5 1/4" INCLUDE SLEEVES/24 HOUR SHIPPING

800-426-0247

We also sell and service duplication equipment and disk duplication services.

PRINCETON DISKETTE

1101 Richmond Ave., Pt. Pleasant Bch., NJ 08742

CIRCLE 597 ON READER SERVICE CARD

Unleash the power of your modem

The Exchange®
Bulletin Board System

Thousands of Free Programs

- Windows
- DOS
- OS2
- Word Processing
- Database
- Games
- Gifs
- E-Mail
- Live Chat & More
- Local Access from over 600 Cities
- All 14.4 kbs High Speed Modems

Great for beginners & advanced users of all ages

Voice only numbers and sign-up

Modem 516/579-6650

N.E.T.A.S. Inc.

CIRCLE 615 ON READER SERVICE CARD

It's A Jungle Out There!

But PC Magazine Classified Delivers The Lion's Share of the Market.

PC Magazine makes seller easier by delivering responsive direct buyers twice monthly.

PC Magazine ads trigger immediate response and direct sales.

Call your PC Magazine Marketplace account representative today at:

1-800-825-4237

PC MAGAZINE

Source: PC Magazine Direct Market Subscriber Study, 1992 (past 12 months)

REMOVE HARDWARE LOCKS

Maintain Productivity!

Software utility that allows for the removal of hardware locks

Easy-Simple-Guaranteed

These and others are available:

MaxRoute	$250.00
Pads PCB	$99.00
CadKey	$99.00
MasterCam	$250.00
Tango PCB II	$99.00
MicroStation	$99.00
PCAD	$250.00

Visa and Mastercard Welcome

Call or Fax for more information

SafeSoft Systems Inc.
201-1111 Munroe Ave.
Winnipeg, MB
Canada R2K 3Z5

PH (204) 669-4639
FAX (204) 668-3566

CIRCLE 598 ON READER SERVICE CARD

The New PC Magazine Classifeid format gives you more for far less...

More color options

New flexible ad sizes

Lower cost-per-inch

Call your PC Magazine MarketPlace account representative today at

1•800•825•4237

and let the new Classified work for you.

1-800-825-4237

PC CLASSIFIED

"Hey, I've seen this GIF before..."

by this time you must be tired of the same gifs. seems every bbs out there has the same collection. the fact is, they're old and rusty. luckily, we've found a cure for your gif boredom: gourmet gallery bbs. we've got lots of gifs too, but they're all 100% original and never-seen-before. sure, eventually our gifs will show up on the other bbs's. but we'll just make more. and more. and more.

TIRED OF GIF DEJA VU? TRY US.

408.956.5656

Gourmet Gallery BBS

12 Lines
New GIFS Daily
2400 - 14.4K bps 8 . N . 1

CIRCLE 599 ON READER SERVICE CARD

FOR ADULTS ONLY

You must be over 21 to access

LIFESTYLE

Meet sexy singles/couples on the world's hottest adult chat system—Lifestyle BBS.

Less than .30 per hour.

Log on: 516-689-5390

AND

GRAFIX

Computer pictures so hot they could melt your modem.

Log on: 516-689-2853

SUPER CHEAP • 100% PRIVATE

Local access from 500+ cities

CIRCLE 600 ON READER SERVICE CARD

Interactive Adult CD's	
Digital Dancing	$50
Dirty Talk	$50
Doors of Passion	$52
Dream Machine	$55
Nightwatch	$55
Seymour Butts	$55

VGA pictures	
Adult Ref. Lib.	$35
Amateur Models	$40
American Girls	$45
Busty Babes # 2	$40
Digital Dreams	$36
High Vol. Nudes	$45
Southern Beauties	$40
Super Smutware	$36
Sweet Dreams	$39
Wild Women	$35

CD-ROM

General Titles	
PhoneDisc	
USA Business	$70
ProPhone '93	$120
Mayo Clinic	$38
The Animals'	$35
PC Sig Ver. 12	$35
And More Titles	

Full feature movies on CD	
101 Positions	$50
After Dark Trilogy	$52
Best of Vivid Clips	$52
Erotica	$50
Hidden Obsessions	$55
House of Dreams	$55
L.A. Strippers	$50
Night Trips	$55
Princess of Persia	$50
RimFire Pacific	$52
Secrets	$55
Tracy I Love You	$50
Wicked	$55
Wicked Whispers	$50

MasterCard/VISA/MASTER

C.J.Ware ORDER LINE

800-554-1836

Call for our free catalog.

C.J.Ware

P.O. Box 3[illegible], Naperville, IL 60566

CIRCLE 601 ON READER SERVICE CARD

WORLD CLASS BBS-ADULT GRAPHICS ON-LINE

A revolution in on-line entertainment where the on-line world meets

Provocative, Sexy, Adult, Tantalizing, Sizzling

BBS NUMBERS

64 lines 14.4k v32bis 8/n/1

- 800-466-6336 — USA
- 503-697-7700 — Anywhere
- COMPUSERVE — World-wide

Call us direct via Compuserve
Membership not required
USA Mainland host name (EVENT)
INTERNATIONAL host name (EVENTI)

On-Line for 10 years
Most successful BBS

As featured on TV:
"A Current Affair",
"Computer Chronicles"
"CBS NEWS", "CNN" and read in
TIME Magazine, Boardwatch,
New Age Media
Cybersex, Newsweek
to name a few

ENDLESS ON-LINE ENTERTAINMENT

SuperVGA 1024x768x256
Movies at 30/fps SVGA!
Video for Windows/AVI/GRASP/FLI/FLC

COLOR MOVIES SUPPORTING

VGA/SVGA/FLI/FLC/SOUNDBLASTER
MOUSE/RAM/EMS
RIP Graphics – The best games on-line
The Center of Infinity
The Black Hole Playground
Journey Through the Universe
Escape from Languor
Easy User Interface
Home of "MaxiPic"

CHAT SYSTEM · LIVE ADULT NATIONAL LINK · MASSIVE COLLECTION ORIGINAL IMAGES AND SOFTWARE. 30,000 USERS.
ASTRONOMY • HUGE ADULT AREA • SCENIC • GRASP • ANIMATOR 3D • GAMES UTILITIES • IMAGE CONVERTERS

Credit cards accepted. Same day shipment. EVENT HORIZONS, INC., 311 Avenue B, Ste. 299, Lake Oswego, Oregon 97034 • Voice (503) 636-7700 or (503) 697-7700 for info.

CIRCLE 602 ON READER SERVICE CARD

Test Drive Our CYBERONIC BBS
(305) 428-0012
- Adult Rated GIFs, JPEGs, & Movies
- Chat with Hostess Sin-D
- Multiplayer Games
- On-line GIF Viewing

Throbnet, Fidonet, & Internet

CD-ROM BIG BANG THEORY

TRY A 3-SOME OR A 4-WAY

We've done all the dirty work and gleaned the Best of the Best adult titles. So take a look at our 3-Somes & 4-Ways below and let us help you build your personal library.

THE AL BUNDY

If you are an everyday kind of guy just like our hero, Al Bundy, and you really love'em big, then this is the Bundle for you. Our 3-Some includes H**ter Heaven, The Adventures of Seymore Butts & Paradise Club Interactive for Windows or Digital Dancing for Mac Users. To make it a 4-Way, just add Nightwatch Interactive

FREE

MultiMedia Gift with every purchase of a Starware 3-Some or 4-Way.

(800) 354-[illegible]

ORDER FAX LINE:
(305) 426-980[illegible]

STARWARE

Department 263
P.O. Box 4188
Deerfield Beach, FL 33442

MUST BE 21 YEARS OLD

NOT FOR CABLE TV 2

This is the Multimedia version of our best selling GIF Bundle. Just wait until you get hold of our most explicit CD's. 3-Some bundle has Cat & Mouse - The Movie New Wave H**kers and Nightwatch Interactive. Watch Traci Lords entertain in Traci I Love You, to make an excellent 4-Way.

NOT READY FOR HOLLYWOOD

Adult movie's BIGGEST names: Teri Weigel, Traci Lords, Zara Whites, Jeanna Fine & more... These lovely ladies will sizzle your screen & blow your sound card. This classic 3-Some includes Wicked - The Movie, Traci I Love You, and The Mark of Zara Photo CD. 4-Way action? Add Legends of P*rn 2.

FOR COUPLES ONLY

Have you ever heard of Adult movies with a plot? We've come as close as possible by putting together the best movies for both of you. The 3-Some includes Cat & Mouse - The Movie, Betrayal and Sleeping Beauties. Swing into a 4-Way by adding Double Play II.

HOT MAGAZINE HONEYS

You've hungered for these honeys through countless magazines and now you can have them permanently on CD-ROM! Our 3-Some includes the most talked about New CD titles – Penthouse Interactive (so hot it counts as two) and Wicked Photo CD (starring former Playboy Playmate Teri Weigel). To make it an Extra Large 4-Way, add H**ter Heaven

Starware Publishing has always been a pioneer in the Adult CD-ROM revolution. In fact, we've been in the business longer than anyone in the industry. So you can have complete confidence in the fact that we offer only the highest quality and latest in Adult CD-ROM technology.

SUPER VGA #2

This will make you forget about GIF disks forever. SUPER HIGH RES IMAGES!!! 24-BIT COLOR!!! All in Kodak's Photo CD format. Two disks even come with complete unlimited usage rights. In our 3-Some, you get The Mark of Zara Photo CD, Cat & Mouse Photo CD and Double Play I. 4-Way special bonus – add Wicked Photo CD with free Kodak Access software.

Ask about our new CD-ROM CLUB
- Free CD's • Contests
- Discounts • Club BBS and more!!!

ALL 3-SOMES ONLY $168
4-WAY ACTION ONLY $208

SHIPPING INFORMATION
Mail Orders receive free 2nd day shipping ups Ground - $4.60 • 2nd Day - $7.25 • Next Day - $[illegible]
Foreign Express - 22.00 • 4-Ways slightly more

VISA

FREE TECH SUPPORT

CIRCLE 603 ON READER SERVICE CARD

HEAT IN THE NITE

America's only FREE, no membership fee ADULT BBS, 1000+ calls daily, 10,000+ users. 60:40 male-female ratio. 14.4k modes, 32 lines! ACTION 24 hrs a day guaranteed. The cache where EROTIC singles and couples MEET!

NEVER A CHARGE! HOT!

One of the nations top 100 BBS's as rated by Boardwatch Magazine!

1-515-945-6227

CIRCLE 607 ON READER SERVICE CARD

SEXY MODEM

Call from home or office!

•The Ultimate BBS•

FREE

- Sexy Chat with Singles/Couples
- 100,000 Shareware & Adult GIF, Windows and DOS files
- USA Today Online
- FREE ACCESS
- Unlimited Downloads
- 14.4k on all 60 Lines
- New GIF's posted daily by our photographers

1-217-792-3663

Must be over 21 to access
Customer Support Voice Line 415-281-4429

CIRCLE 608 ON READER SERVICE CARD

FREE GIFS

Download the "SEXIEST" & most "STIMULATING" Images from our ADULT On-Line Magazine - FREE !

LACE is an On-Line Magazine that offers you:

- ABSOLUTELY the best Color Photographs and Color Scans in the world & not available on any other BBS!
- GORGEOUS Sexy Models both Amateur & Professional !
- VIDEO for Window's Files, the latest & hottest Microsoft Product. Play these Videos on your computer. (.AVI)
- LOCAL ACCESS #'s for over 800 cities in the U.S.
- ALL NEW FILES in our FREE files AREA !
- HIGH SPEED access available. (14.4k down to 1200 baud)
- AND . . . RATED #1 BY OUR USERS !!

Set your Modem to 8-N-1 and your terminal emulation to ANSI

(818) 709-4275

Questions? Call our voice line at (818) 709-3795

LACE

the on-line adult magazine

Must be 18 Years of Age or Older • Limited Offer

CIRCLE 609 ON READER SERVICE CARD

ADULT CD-ROM

REG Publishing is proud to introduce its new line of Adult CD-ROM products featuring gorgeous Centerfold Models in exciting poses & settings from Mild to Wild. ABSOLUTELY the best quality CD-ROM product on the market today!

"COD - Volume #1": features "20" Sexy Models in exciting men's magazine type layouts. There are over 240 images to be displayed either in an 8 bit or 24 bit format. PLUS we've selected 40 of these images for 1024 x 768 display, too!

If you are looking for a quality product that offers Outstanding Photographic Images and Scans that appear as if they are "3" Dimensional . . where you feel as if you can reach out and touch them, then REG Publishing is your new home for quality Adult Entertainment.

To Order "COD Volume #1" for only $69.95 plus $3.00 postage/handling call:

(818) 993-5629

Visa/MasterCard/AMX accepted. OR to order by mail send check or money order to: REG Publishing, POB 5138, Chatsworth, CA 91313-5138.

Requirements: IBM PC & Windows. Will work with DOS viewing programs, too.

Adults Only • Dealer Inquiries Invited

Where Adults Come To Play!

The World's Choice For HOT MODEM FUN!

- HOT CHAT Live W/Thousands of Ladies & Gents in Groups & Private!
- Tons Of Sizzling Hot Message Areas, Shareware Files and Adult GIFs!
- Matchmaker With "DATING-BASE"!
- Straight and Gay Sections!
- Live Competitive Tournament Gaming!
- Unlimited Connect With One Low Price!

Local Numbers In Over 800 Cities!

Plus Much Much More!

Now With Our Exclusive FANTASY Area!

ODYSSEY BBS

For Modem Signup or More Info Call:

818-358-6968

CIRCLE 612 ON READER SERVICE CARD

Sexy Software™ SEXY DISKS™ — Sexy Software™ SEXY CD-ROMS™

Sexcapades™ . . . The GAME

The First Adult Game with TRUE SOUND and 256 Color VGA Graphics

The game everyone has been waiting for. For that evening you won't forget with a loved one or group of very close friends. Fulfill your sexual desires. Find out how your partner would really like to make love. Over 80 Color VGA Scenes • Real Voices Guide the Action • Play with 2-8 Close Friends. Now supports SoundBlaster™ cards!

$79 – Special Offer: $69 with purchase of any CC disk - VGA and hard disk required - shipped on high density disks

CONNOISSEUR COLLECTION ALL NEW! In 256 Color VGA!!

ALL movies have sound - play thru standard speaker or SoundBlaster™

Sexy Disk #CC1 • ★ YOU BE THE STAR ★ The FIRST CUSTOMIZABLE movie. You write the dialog and title

Sexy Disk #CC2 • THE FIRST SOUND MOVIE! The first computer movie with SOUND. See the incredible 256 color VGA graphics while hearing the actual dialog. OURS EXCLUSIVELY!

Sexy Disk #CC3 • THE BEST MOVIE! The best computer movie available. Only for the serious collector. 256 stunning VGA colors

Sexy Disk #CC4 • VOLUPTUOUS MOVIE with Sound! See and hear a symphony of exceptionally proportioned women

Sexy Disk #CC5 • ODDITIES MOVIE with Sound! See men of incredible proportions and women with unique abilities. UNBELIEVABLE!

Prices: 1 Movie $29, 3 Movies $65, 5 Movies $94

NEW!! Exclusively imported from Europe!! 256 Color VGA Games

SG4 P...TRIS - Adult version of the popular game. You reveal a hidden movie while controlling blocks falling down your screen. Multiple levels. MUST SEE!

SG5 P...PIPE - Adult version of Pipe for Windows (Windows not required) - Multiple movies revealed as the game progresses. HOURS OF FUN!

SG6 MOZAIK - Adult jigsaw puzzles with over 45 celebrity pictures - you reassemble the most exciting women on earth

Price: $35 each or all 3 for $89

ORIGINAL Sexy DISKS - 6 disk set with movies, pictures, games $32

ADD $4 S/H • 3.5" Or FOREIGN ORDERS ADD $2/DISK • IN PA ADD TAX • MUST STATE AGE OVER 21 YEARS

VISA/MC Orders Only: 800-243-1515 Ext. 600CF / 24 HRS / 7 DAYS

FAX (215) 997-2571 • Or CK/MO to: Sexy Software, P.O. Box 220, Dept. 600CF, Hatfield, PA 19440

FREE $99 Shareware CD-ROM

with purchase of any 3 CD ROMS. Not a cheap demo disk - contains thousands of valuable programs in all categories - games, windows, business, education

Sexy FLIX – Full Length Digital Movies - Ours Exclusively!

KING DONG – The largest dinosaur movie ever made. CRYSTAL HOLLAND stars with prehistoric monsters, cannibals, and lots of special effects

TOO NAUGHTY TO SAY NO – HARRY REEMS and GINGER LYNN star in an erotic daydream in a boarding school for girls - from CABALLERO HOME VIDEO. dir SUZE RANDALL

SEX GAMES - When a hacker taps into a computer dating service he is able to program the wildest fantasies of its sexiest member - SAUNA GRANT stars

Sexcapades – The MOVIE – See incredible uses of a mouse and a joystick as a group of friends play our popular Sexcapades game

NO HARD DISK SPACE REQUIRED - WINDOWS NOT REQUIRED

Sexy CD-ROMS

Sexy CD #1 the premiere adult collection - 680 MB of action with: 5268 VGA pictures, 87 movies, 674 stories, games DARE TO COMPARE!

Sexy CD #2 an exclusive collection containing over 900 Super VGA pictures (1024 x 768 x 256) and over 400 VGA pictures (640 x 480 x 256). These are pictures that cannot be found anywhere else! The women and the quality are stunning

Sexy CD #3 another collection of over 650 MB of the hottest pictures available. Over 5,000 VGA pictures, movies and utilities that will have you spending days just trying to see it all!

MENU DRIVEN VIEWING - NO DUPLICATION

MIX & MATCH CD-ROMS / Sexy PIX™

SUNSHINE BABES • ECSTACY • ASIAN LADIES • HOT PIX 2, 3 & 4 • PC PIX 1, 2 & 3 • TROPICAL GIRLS • STORM 3 • EROTIC GIRLS • 7TH HEAVEN • EROTIC ENCOUNTERS • ADULT PALETTE • MY PRIVATE COLLECTION 1 & 2 • ANIMATION FANTASIES 1 & 2 • PORKWARE

ALL CD-ROMS: First 3 $99 each or 3 for $199 (PLUS FREE SHAREWARE CD-ROM) Then $69 each or 3 for $149

CIRCLE 610 ON READER SERVICE CARD

BodyCello

FREE* ADULTS ONLY CD SAMPLER

Sample 20 demos of the finest in adult entertainment software. See new interactive titles, beautiful nudes and artwork.

MAC/MPC CD-ROM #555

Must be 21 to order. Dealer Inquiries Welcome.

*Send $4.75 for postage/handling in U.S. (Outside the U.S. & Canada send $15)

CALL FOR A FREE COLOR CATALOG!

BodyCello • P.O. Box 910531 Sorrento Valley, CA 92191 • 619-578-6969 • FAX: 619-536-2397

1-800-922-3556

8M1

CIRCLE 614 ON READER SERVICE CARD

San Francisco's Premier Adult Gay Men's Online Service has NOW gone Nationwide!

- Local access from over 1,000 US cities!
- Live uncensored group & private chat!
- Online, interactive, multi-player games!
- Lively salon style public forums!
- Over 20,000 Adult rated GIFS & files!
- MatchMaker online databases!
- 50+ lines available 24 hours a day!
- Gay owned and operated, your privacy assured!
- *Much, much more!*

For your local access number, information, & signup, CALL:

(415) 703-8200

Set modem to 8/N/1. You must be 18 or older.

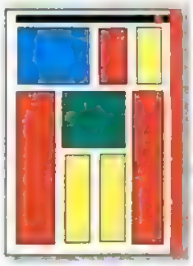
Finally...a national adult Gay men's BBS!

EYE CONTACT

CIRCLE 612 ON READER SERVICE CARD

THE NEW PC MAGAZINE CLASSIFIED FORMAT GIVES YOU MUCH MORE FOR FAR LESS...

- New Flexible Ad Sizes
- More Color Options
- Lower Cost-per-Inch Rates



Call your PC Magazine Marketplace account representative today at:

1-800-825-4237

and let the new Classified work for you.

FOR QUICKER RESPONSE
FAX TO
(609) 829-0692

Free Product Information

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 433 RIVERTON, NJ

POSTAGE WILL BE PAID BY ADDRESSEE

PC MAGAZINE

P.O. Box 1687
RIVERTON, NJ 08077-9687

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

PC MAGAZINE **READER SERVICE CARD FREE INFORMATION**

IT'S AS EASY AS 1, 2, 3

1. Fill in your name and address and check off your answers to the nine research questions.
2. Circle the numbers on the card that correspond to the ads or articles you'd like more information about.
3. The literature will be mailed to you from the advertiser free of charge.

CIRCLE FOR FREE INFORMATION

Void after May 31, 1994

001	002	003	004	005	006	007	008	009	010	011	012	013	014	015	016	017	018	019	020	021	022	023	024	025	026	027	028	029	030	031	032	033	034	035	036	037	038	039	040	041	042	043	044	045	046	047	048	049	050
051	052	053	054	055	056	057	058	059	060	061	062	063	064	065	066	067	068	069	070	071	072	073	074	075	076	077	078	079	080	081	082	083	084	085	086	087	088	089	090	091	092	093	094	[illegible]	096	097	098	099	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	[illegible]	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	[illegible]	346	347	348	349	350
351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	[illegible]	396	397	398	399	400
401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	[illegible]	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	[illegible]	496	497	498	499	500
501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550
551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600
601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	[illegible]	646	647	648	649	650
651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	[illegible]	696	697	698	699	700
701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750
751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	[illegible]	796	797	798	799	800
801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	[illegible]	846	847	848	849	850
851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	[illegible]	896	897	898	899	900
901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950
951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	

1. Do you work in a DP/MIS dept.?
01. ☐ Yes 02. ☐ No

2. Please indicate your company or organization's primary business activity: (Check one)
01. ☐ Manufacturer Computer Equip., Computers, Software
02. ☐ Manufacturer–Aerospace
03. ☐ Manufacturer–Other
04. ☐ Systems House
05. ☐ Computer Consultant
06. ☐ Computer Retailer/VAR/VAD Distributor
07. ☐ Communications
08. ☐ Finance/Banking/Insurance/ Real Estate/Accounting
09. ☐ Education
10. ☐ Government
12. ☐ Research and Development
13. ☐ Data Processing/Computer Service
14. ☐ Health/Medical/Legal Service
15. ☐ Engineering/Architecture
16. ☐ Agr./Const./Mining/Oil/ Transp./Utilities
17. ☐ Non-Computer Retailer/Dist.
18. ☐ Other Business or Service

3. Please indicate your primary business function: (Check one)
01. ☐ DP/MIS
02. ☐ Systems, Programming
03. ☐ Communications
04. ☐ Engineering
05. ☐ Res./Dev./Scientific
06. ☐ Accounting/Finance
07. ☐ Computer Consulting
08. ☐ Purchasing
09. ☐ Operations
10. ☐ Production
11. ☐ Education/Training
12. ☐ Marketing/Sales
13. ☐ Medical/Legal
14. ☐ Admin./Mgmt.

4. Is your company a reseller?
01. ☐ Yes 02. ☐ No

5. For how many IBM PCs and compatibles do you specify brands of products:
01. ☐ 10 or less 03. ☐ 26-99
02. ☐ 11-25 04. ☐ 100 or more

6. Are there any PCs in your office?
01. ☐ Linked to mainframe
02. ☐ Linked to mini
03. ☐ Networked together

7. Please check the equipment currently installed at your location: (Check all that apply)
01. ☐ IBM or Compatible PCs
02. ☐ IBM or Compatible Mainframes
03. ☐ IBM or Compatible Minis
04. ☐ Macintosh
05. ☐ CD-ROM
06. ☐ Windows

8. Do you plan to buy any PC products?
01. ☐ Now 03. ☐ In 7 to 12 months
02. ☐ In 4 to 6 months 04. ☐ No definite plans

9. Number of employees in your entire company:
01. ☐ 25 or less 03. ☐ 100-499 05. ☐ 1000 or more
02. ☐ 26-99 04 ☐ 500-999

Name PC 1/25 -5

Title Telephone

Company Name

Address

City State Zip

☐ Please send me a one-year (22-issue) subscription to PC Magazine for $29.97 (U.S. price); all other countries add $36.00 for additional postage.

In a Hurry? Fax This Card To: 609-829-0692

PC MAGAZINE READER SERVICE CARD FREE INFORMATION

IT'S AS EASY AS 1, 2, 3

1. Fill in your name and address and check off your answers to the nine research questions.
2. Circle the numbers on the card that correspond to the ads or articles you'd like more information about.
3. The literature will be mailed to you from the advertiser free of charge.

CIRCLE FOR FREE INFORMATION

Void after May 31, 1994

001	002	003	004	005	006	007	008	009	010	011	012	013	014	015	016	017	018	019	020	021	022	023	024	025	026	027	028	029	030	031	032	033	034	035	036	037	038	039	040	041	042	043	044	045	046	047	048	049	050
051	052	053	054	055	056	057	058	059	060	061	062	063	064	065	066	067	068	069	070	071	072	073	074	075	076	077	078	079	080	081	082	083	084	085	086	087	088	089	090	091	092	093	094	095	096	097	098	099	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350
351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400
401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500
501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550
551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600
601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650
651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700
701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750
751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
801	802	803	804	805	806	807	808	709	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850
851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900
901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950
951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	

1. Do you work in a DP/MIS dept.?
01. ☐ Yes 02. ☐ No

2. Please indicate your company or organization's primary business activity: (Check one)
01. ☐ Manufacturer Computer Equip., Computers, Software
02. ☐ Manufacturer–Aerospace
03. ☐ Manufacturer–Other
04. ☐ Systems House
05. ☐ Computer Consultant
06. ☐ Computer Retailer/VAR/VAD Distributor
07. ☐ Communications
08. ☐ Finance/Banking/Insurance/Real Estate/Accounting
09. ☐ Education
10. ☐ Government
12. ☐ Research and Development
13. ☐ Data Processing/Computer Service
14. ☐ Health/Medical/Legal Service
15. ☐ Engineering/Architecture
16. ☐ Agr./Const./Mining/Oil/Transp./Utilities
17. ☐ Non-Computer Retailer/Dist.
18. ☐ Other Business or Service

3. Please indicate your primary business function: (Check one)
01. ☐ DP/MIS
02. ☐ Systems, Programming
03. ☐ Communications
04. ☐ Engineering
05. ☐ Res./Dev./Scientific
06. ☐ Accounting/Finance
07. ☐ Computer Consulting
08. ☐ Purchasing
09. ☐ Operations
10. ☐ Production
11. ☐ Education/Training
12. ☐ Marketing/Sales
13. ☐ Medical/Legal
14. ☐ Admin./Mgmt.

4. Is your company a reseller?
01. ☐ Yes 02. ☐ No

5. For how many IBM PCs and compatibles do you specify brands of products:
01. ☐ 10 or less 03. ☐ 26-99
02. ☐ 11-25 04. ☐ 100 or more

6. Are there any PCs in your office?
01. ☐ Linked to mainframe
02. ☐ Linked to mini
03. ☐ Networked together

7. Please check the equipment currently installed at your location: (Check all that apply.)
01. ☐ IBM or Compatible PCs
02. ☐ IBM or Compatible Mainframes
03. ☐ IBM or Compatible Minis
04. ☐ Macintosh
05. ☐ CD-ROM
06. ☐ Windows

8. Do you plan to buy any PC products?
01. ☐ Now 03. ☐ In 7 to 12 months
02. ☐ In 4 to 6 months 04. ☐ No definite plans

9. Number of employees in your entire company:
01. ☐ 25 or less 03. ☐ 100-499 05. ☐ 1000 or more
02. ☐ 26-99 04. ☐ 500-999

Name

PC 1/25 -5

Title | Telephone

Company Name

Address

City | State | Zip

☐ Please send me a one-year (22-issue) subscription to PC Magazine for $29.97 (U.S. price); all other countries add $36.00 for additional postage.

In a Hurry? Fax This Card To 609-829-0692

FOR QUICKER RESPONSE FAX TO (609) 829-0692

Free Product Information

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 433 RIVERTON, NJ

POSTAGE WILL BE PAID BY ADDRESSEE

PC MAGAZINE

P.O. Box 1687
RIVERTON, NJ 08077-9687

PC MAGAZINE MARKETPLACE BUSINESSCARD

PC Magazine's BusinessCard section is a forum for innovative, hard-to-find and low-cost PC products and services. Ads are listed by product category and include Reader Service numbers to allow fast, easy response.

RATES:
1 issue–$800, 3 issues–$700, 6 issues–$630, 12 issues–$640, 17 issues–$610, 22 issues–$600. Multiple-ad per issue rates also available. Prepayment must accompany each insertion. VISA/MC welcomed.

AD FORMAT:
PC Magazine will typeset each BusinessCard ad. Advertisers should furnish typewritten copy. Ads include: 1) Headline (1 line, initial caps=30 characters max, all caps=25 characters max), 2) Descriptive copy (5 lines, 225 characters max), 3) Company name (same specifications as headline), and 4) Address and telephone number (2 lines, 40 characters per line). No logos, artwork or camera-ready ads. Publisher reserves the right to edit supplied copy to meet section specifications.

DEADLINES:
PC Magazine is published 22 times a year, (bimonthly except for July and August). The BusinessCard closing is approximately two months prior to issue date.

Please send copy and payment to:
PC Magazine BusinessCard
One Park Avenue, 3rd Floor
New York, NY 10016
For more information, call 800-825-4237 *or* 212-503-5115, FAX: 212-503-5860.

HARDWARE ADD-IN-BOARDS

VESA LOCAL BUS EVERYTHING
Distributors of only the finest VL-Bus video cards, motherboards, (w or w/o CPU) and controller cards. By far the best price and tech support... since 1986. Please call for free info. 486/P24T MB w/256KCC & DX2-66 CPU=$520.00.

HSB COMPUTER WHOLESALE
34208 Aurora Rd. #297, Cleveland, OH 44139
Tel: 1-800-497-0401 Fax: (216) 498-1374

CIRCLE 651 ON READER SERVICE CARD

BAR CODING

BAR CODE DISCOUNT WAREHOUSE
will not be undersold! Your source for all your bar code needs. Laser and CCD scanners, mag stripe and wedge readers, bar code printers and software. We offer major brands at the best prices.
1-800-888-BCDW

BAR CODE DISCOUNT WAREHOUSE
14761 Pearl Rd., #257, Strongsville, OH 44136
Tel: (216) 273-4746 Fax: (216) 273-4623

CIRCLE 652 ON READER SERVICE CARD

BATTERIES

YOU DESERVE LONGER LIFE!
Why does your "2-hr" battery only last 15 minutes? Try our extra long life Battery Packs, Chargers & Conditioners for Notebook, Cellular & Camcorders. Call or write us today for free catalog & guide to longer battery life! Guaranteed low $! V/MC or P.O.

POWER EXPRESS
4976 Stuckey Drive, San Jose, CA 95124-5120
800-769-3739 (8A-5P PST) Fax:408-559-5969

CIRCLE 653 ON READER SERVICE CARD

COMPUTER BATTERIES & MORE
Sanyo,Tadiran, Panasonic, Eveready, Gates, Lithium, Lead Acid, Ni-Cad, Alkaline & Chargers. We stock batteries for laptop/notebook, Camcorders, cordless phones, drills, Norelco shavers, RC Cars & Invisible Fence. Corp PO #'s Wholesale! MC/VI

Battery Express
713 Gladstone St., Parkersburg, WV 26101
1-800-666-2296 Fax:304-428-2297

CIRCLE 654 ON READER SERVICE CARD

Hand Your Business Card...
To 1,020,353 of the most qualified buyers in the PC market. These brand-specifiers are looking to buy while reading the industry's #1 publication. There is no more cost-effective or efficient way for you to build sales.

BusinessCard
Call your BusinessCard representative today.
1-800-825-4237

CIRCLE 655 ON READER SERVICE CARD

COMMUNICATIONS/NETWORKING

KEYBOARD, VIDEO, MOUSE
EXTENSION with EXTENDER
SPLITTING with COMPANION
SWITCHING with COMMANDER
Boosts SIGNALS UP to 600 FT. Control Up to 96PC's with one KEYBOARD and MONITOR.

CYBEX CORPORATION
4912 Research Drive, Huntsville, AL 35805
PHONE 205-430-4000 FAX 205-430-4030

CIRCLE 656 ON READER SERVICE CARD

COMPUTER SYSTEMS

README.1ST - AND SAVE !!!
Tired of paying retail prices for computer parts and accessories? Call ASCI for your FREE catalog.

SAVE ON: Cases, Drives, Keyboards, Modems, Monitors, Motherboards, Video Cards & more...

800-238-ASCI
Hicksville, New York, USA
Fax: 516-935-5231

CIRCLE 657 ON READER SERVICE CARD

COMPUTER/SOFTWARE SAVINGS
Hewlett Packard Printers, Full line of Compaq, IBM, Toshiba, NEC and Apple Computers
Novell, Aldus, Microsoft, Lotus & other software.
We also carry a full line of IBM compatible systems. Call. We ship anywhere. Visa/MC.

COMPUTER REVELATIONS
331 E. Dante Court Holbrook, NY 11741
800-275-9924 Fax 516-737-0923

CIRCLE 658 ON READER SERVICE CARD

VOICE/FAX

INSTANT INFO VIA FAX
FaxFacts, Interactive Fax-on-Demand, allows you to deliver info automatically, twenty-four hours a day. Customers use a touchtone phone to get a "fax of information".
Demo Call 708/924-3030 Request 889833

Copia International Ltd.
1342 Avalon Ct., Wheaton, IL 60187
708/682-8898 FAX: 708/665-9841

SOFTWARE ACCOUNTING

Industrial Strength Payroll
Full-featured, live and after-the-fact, multi-state, multi-client payroll processing system. Accepts mixed pay periods. Does 941, 2, 3; W2 and W3. Does cafeteria plans, 401(k), 403(B) $245.00. With MICR encoding $560.00 V/MC/AX

PHOENIX PHIVE SOFTWARE CORP.
7830 E. Gelding, #400 Scottsdale, AZ 85260
Call 800-331-1811 or Fax 602-948-1379

CIRCLE 660 ON READER SERVICE CARD

THE EASIEST OF THEM ALL™
Full featured FoxPro based Integrated Accounting for PC's. Faster, More Complete and Easier to Use, See PC Magazine May 12, 1992. Only $295.00 Call for free info kit, demo disk and upgrade offer.

PC ACCOUNTANT™
P.O.Box 2278, Kirkland, WA 98083
800-827-1303 206 827-4361

CIRCLE 661 ON READER SERVICE CARD

ACCOUNTING SOURCE-CODE
Integrated or stand-alone accounting modules. G/L, P/O, A/P, O/E, A/R, Payroll and more. DBase, Fox, and Clipper source-code provided. Single or Multi-user, $99/$198. Demo disk $5. Free technical support, dealers are welcome.

Datamar Systems
6969 Corte Santa Fe, San Diego, CA 92121
(619) 452-0044, FAX (619) 452-0088

CIRCLE 662 ON READER SERVICE CARD

BUSINESS

UPS Shipping Software
Works stand-alone or w/ your acctg SW (DacEasy, Peachtree, Macola, Great Plains RealWorld etc.). Calculates zone & charges, Prints Manifest, COD tags, shipping labels. Optional carriers and scale intf. Guaranteed UPS acceptance. 60-Day MBG.

V-Technologies
P.O. Box 6261, Wolcott, CT 06716
(203) 879-6960 Fax: (203) 879-6962

CIRCLE 663 ON READER SERVICE CARD

CD-ROM

New and Updated CDROM's
Cica MS Win 3000 Windows 3.1 Prgms $29.95
Giga Games 3000 Fun DOS/Windows Game 39.95
Simtel MSDOS 680 meg DOS Shareware 29.95
Hobbes OS/2 640 meg Free/Shareware 29.95

Walnut Creek CDROM
Guaranteed! 4041 Pike #d521 Concord, CA 94520
Visa/MC/AmEx 800 786 9907 Fax 510 674 0783

CIRCLE 664 ON READER SERVICE CARD

FREE CD-ROM DISCOUNT CATALOG!
Hundreds of discounted CD-ROM titles, from $8 up. Call or write for your free catalog.

Ellis Enterprises, Inc.
4205 McAuley #385, Oklahoma City, OK 73120
1-800-729-9500

CIRCLE 665 ON READER SERVICE CARD

PC MAGAZINE MARKETPLACE BUSINESSCARD

CELLULAR PHONES

TWO PHONES - ONE NUMBER

Change NAM & ESN info on your PC for Motorola, Mitsubishi, Panasonic, NEC Cellular Phones & have an extension. Why pay two bills? Call our fax on demand for details. Only $495 with free technical support.

Cellular Press
421 N. Rodeo #15318 Beverly Hills, CA 90210
Fax/Demand: 800-438-4511 Ph: 310-289-2174

COMMUNICATIONS/NETWORKING

PC VOICE MAIL KIT $1795

• Voice Processing on your PC • Software and 4 line board included • Order Taking • AUDIOTEX • Voice Messaging • Never miss another call! • HUNDREDS OF USES • Don't pay $1,000's CALL TODAY FOR Free DETAILS • 2 yr warranty

Amerifax Services Corp.
572 W. Market St. #5, Akron, OH 44303
(216) 253-8787 • (216) 762-6050 Demo

CIRCLE 667 ON READER SERVICE CARD

DON'T WRITE NETWORK APPS!

Without NPPC, powerful subroutine library that handles the details of IPX and NetBIOS programming. DOS & Windows. $ back guarantee. Royalty free. Download the free demo from our BBS. $195 or $395 with source.

SOFTWAREHOUSE CORPORATION
326 State Street, Los Altos, CA 94022
415-9490203Fax415-9490208BBS415-9490207

CIRCLE 668 ON READER SERVICE CARD

DATA BASE

dBASE file access from C, Basic,..

CodeBase 5.0 gives complete database management with multi-user dBASE, FoxPro or Clipper file compatibility from C, C++, Pascal or Basic. Full 90 day money back guarantee. Order now for a FREE CodeReporter or call now for a FREE demo.

SEQUITER SOFTWARE INC.
PO Box 575 New Market, NH 03857-0575
Call (403) 437-2410, Fax (403) 436-2999

CIRCLE 669 ON READER SERVICE CARD

DATA ENTRY

The Data Entry Emulator™

Full featured, heads-down data entry with two-pass verification, edit language, operator stats, batch control, output record reformat, on-line help, free tech support. From $395. LAN version available.

Computer Keyes
21929 Makah Road, Woodway, WA 98020
800-356-0203/206-776-6443/Fax:206-776-7210

ENGINEERING

SIMULATION

GPSS/PC™ is full-power version of the most popular mainframe simulation language, GPSS. Designed for interactive use on high-speed microprocessors, it has 6 graphics and animation windows. It predicts behavior of complex systems.

MINUTEMAN SOFTWARE
P.O. Box 171/B, Stow, MA 01775
800-223-1430/508-897-5662 Ext.316

CIRCLE 671 ON READER SERVICE CARD

FOREIGN LANGUAGES

LEARN TO READ JAPANESE

KANJI 2045-a powerful study tool which covers 2045 characters. Search, self-test, and more. Cross-referenced with 4 different character dictionaries and the Canon WordTank. Requires Windows 3.1+ and 20-30 MB disk space. $149+$15

Educational Software International
272 Kalalau St., Honolulu, Hawaii 96825
Phone: (808) 396-1161 Fax: (808) 396-9231

CIRCLE 672 ON READER SERVICE CARD

FOREIGN LANGUAGE SOFTWARE

Chinese, Japanese & over 80 other languages: Font makers, Translators, Tutorials, Developer's tools & related software. Japanese & Chinese speaking staff. 24 hr info/fax-on-demand for samples & info. Call for catalog. VI/DIS/MC

Character Language Resources
2130 Sawtelle Blvd. Ste. 300B, L.A., CA 90025
310-996-2300/800-569-2099/FX:310-996-2303

CIRCLE 673 ON READER SERVICE CARD

HUMAN RESOURCE MANAGEMENT

WORKWISE-EMPLOYEE FILE

REDUCE LEGAL EXPOSURE! Document performance, days off & attendance analysis, benefits, certification expirations, EEOT. Data, corp. mail. Great for evaluations & multi-location WINDOWS-BASED. Dealers Welcome. $395

Paradigm Software Development
2510 Western Ave #500 Seattle, WA 98121
Ph: 1-800-WORKWISE Fx: 1-206-728-8401

CIRCLE 674 ON READER SERVICE CARD

INVENTORY

INVENTORY MANAGEMENT

Stock-Master 4.0, com. grade system, has Stock Status Rptg, PO Write & Track, Trend Analysis, QC Rptg, Trans Hist Detail Analysis, Multi Loc support, BOM, Matl Req Planning, Serial/Lot No Track, Quote/Ord/Inv Prep.

Applied Micro Business Systems, Inc.
177F Riverside Ave., Newport Beach, CA 92663
714-759-0582

CIRCLE 675 ON READER SERVICE CARD

WAREHOUSE INVENTORY

Barcodes identify receipts, locations, and shipments. Audit trails. Multi user. Multi languages. Options: EDI receive/ship, lottrack, expiration dates, markdowns, transfers. Connect scales, purch. orders, and cust. order entry.

BGD COMPUTER SYSTEMS, INC.
212 W. Front St. Statesville, NC 28677
Tel: 704-878-8877 Fax: 704-878-0398

CIRCLE 676 ON READER SERVICE CARD

MAILING/MAIL ORDER

Mail Order Manager (™)

America's favorite integrated solution for mail/phone order business - order entry, credit card processing, UPS manifest, accounting, telemkt'g, mailing list mgmt & more! Single & Multi-user systems starting at $1195. Working Demo $25 (Ref)

Dydacomp Development Corp.
150 River Road, Ste N1 Dept.PCM, Montville, NJ 07045 Tel:800-858-DMOM or 201-335-1256

CIRCLE 677 ON READER SERVICE CARD

HOW TO SAVE POSTAGE!

Eliminate costly duplicates, verify and clean up addresses, add ZIP+4 and Carrier Routes, POSTNET barcodes and more. Something for all your mailing needs! Call for FREE Catalog. Your #1 Source for Direct Mail Software

MAILER's Software™
970 Calle Negocio San Clemente, CA 92673
Call 1-800-800-MAIL for catalog

CIRCLE 678 ON READER SERVICE CARD

EARN BIG-$ WITH YOUR PC

Send for guide on 12 easy start money making

Ways to cash in with your home computer

Only 7.50 US - Send check or money order to:

BRITE-IDEA'S ENTERPRISES
145 Hillcredt Ave. Suite #1708F Mississauga Ontario L5B3Z1 or Call 905 896-1080

CIRCLE 679 ON READER SERVICE CARD

MAINTENANCE/PREVENTIVE MAINTENANCE

MAINTENANCE MANAGEMENT

PC-based system for the small to medium size business. FEATURES: Work Orders (space for detail instructions & safe work procedures), equipment descriptions, historical data, operating & analytical reports, inventory. Write for free Demo!!

PENGUIN COMPUTER CONSULTANTS
P.O.Box 20485, San Jose, CA 95160
800-521-0545 (408)997-7703 Fax (408)927-0570

CIRCLE 680 ON READER SERVICE CARD

MANUFACTURING

FLEXIBLE INTEGRATED MFG.

Advanced SUMIT
- Manufacturing
- Materialle
- Advanced Manufacturing
- Accounting

Customizable, Modular, Relational DBMS, PC LAN Based

T.L. Creates, Inc.
345 N.Yosemite St., Ste 200, Stockton, CA 95203
Tel: (209)-946-0105 Fax: (209)-946-0150

CIRCLE 681 ON READER SERVICE CARD

MAPPING

Geo Whiz Desktop Map & Database

$129.95 gives you US maps. Overlay your data on maps with several options.• 360K miles of roads & Hwys • Variable zoom • Find lat/long coordinates • Import/export data • Print maps. Options:5-digit zip database, Detailed county maps

KOSITZKY & ASSOCIATES, INC.
1601 Greenbriar Pl. Ste. J, Okc., OK 73159
PH: 405/692-1683 FAX: 405/692-1698

CIRCLE 682 ON READER SERVICE CARD

We Make It So Easy—

Leave your business card with us and we'll do the rest. PC Magazine will create your BusinessCard for you. It's so easy—and so very effective.

BusinessCard
Call your BusinessCard representative today.
1-800-825-4237

CIRCLE 683 ON READER SERVICE CARD

PC MAGAZINE MARKETPLACE BUSINESSCARD

MEDICAL

LYTEC MEDICAL
Advanced practice management for only $199.00. According to PC World: "This program is packed but costs only a tenth of what its competitors charge...The key features are all here." Network and Windows versions also available.

Lytec Systems, Inc.
7050 Union Park Center, Suite 390
Midvale, UT 84047 Tel:1-800-735-1991

CIRCLE 684 ON READER SERVICE CARD

PRACTICE BILLING
MD VersaForm,flexible,ledger based design,billing package. Programmable; customizable reports, files, & screens; includes database mgmt system & full source. ECS. LAN support. $1,295 sgl user. Free lit & demo. Dlrs wanted.

Applied Software Technology
591 W.Hamilton Ave., Ste 201, Dept. 99
Campbell, CA 95008 (800) 678-1111 Ext.99

PRACTICE BILLING - Software
Nationwide use since 1979. ELECTRONIC CLAIMS. Full support. Simple Q/A. Full pt. ledgers, stmts, reports, everything. Tutorial. On-line help. LAN compatible. Physician designed. Single User: $495+. Newsletter, FREE WORKING DEMO, virus free.

Physicians' Office Computer
1240 Kona Drive, Rancho Dominguez, CA 90220
800-782-5214

CIRCLE 686 ON READER SERVICE CARD

MUSIC

SongWright Out Scores The Rest
"Impressive output...solid list of features."
An Electronic Musician survey proves SongWright the BEST BUY of all music notation software. Save hundreds of dollars. Make your music easy with SongWright. Only $119.95.

SongWright Software
7 Loudoun Street S.E., Leesburg, VA 22075
(800) 877-8070 (703) 777-7232

CIRCLE 687 ON READER SERVICE CARD

PROGRAMMERS TOOLS

BASIC PROGRAMMING TOOLS
Crescent offers many tools for QuickBASIC, PDS, and Visual Basic, all with tutorials and full source. Assembly routines, graphics, screen design w/data entry, BASIC TSR's, and much more. No royalties. Call or write for our catalog.

CRESCENT SOFTWARE, INC.
11 Bailey Avenue, Ridgefield, CT 06877
Orders: 800-35-BASIC, Tech: 203-438-5300

MULTIPLY—
Your sales by handing your business card to 1,020,353 buyers at one time in the place where they seek to buy—tell them about your product in PC Magazine Marketplace BusinessCard.

BusinessCard
Call your BusinessCard representative today.
1-800-825-4237

CIRCLE 689 ON READER SERVICE CARD

REAL ESTATE

Property Management
With Rental-Ease save $$ on your investment! Guaranteed to be the easiest & fastest property management system available at any price. Versions for owners, professionals, networks. $395 to $1295. Demo $10. Dealers welcome!

Strategic Office Systems
688 N.500 W.#61, Mt. Pleasant, UT 84647
(800) 942-6784 or (801) 462-2130

CIRCLE 690 ON READER SERVICE CARD

The Landlord® & The Landmaster®
Property management software purchased by more than 5,000 owners and property managers since 1980. Handles residential and commercial tenant accounting; prints checks and statements. G/L and A/P included. From $595 to $2200.

The Landlord Software Center
427 East Patrick Street, Dept. E
Frederick, MD 21701 (301) 695-1544

CIRCLE 691 ON READER SERVICE CARD

RELIGION

Bible Study Software
For 10 years we have remained the leading Bible study software company. Think of us as a Bible bookstore with an integrated family of software products for your Bible study needs! Call for a FREE catalog!

Bible Research Systems
2013 Wells Branch Pkwy. #304 Austin, TX 78728
1-800-423-1228 1-512-251-7541

SCIENTIFIC

SCIENTIFIC SOFTWARE
- Graphing——SigmaPlot™
- Statistics——SigmaStat™
- 2D/3D Curve fitting——TableCurve™
- Measurement——SigmaScan/Image™

Jandel Scientific
800-874-1888 or 415-453-6700
FAX: 415-453-7769

CIRCLE 693 ON READER SERVICE CARD

CONTOUR MAPS FROM WINDOWS
Z-CON, a Windows based mapping and contouring application, easily creates publication quality maps from randomly distributed data points. Export to DXF or Windows clipboard for use in spreadsheets and reports. Only $149!

ROCKWARE, INC.
4251 Kipling St., Suite 595, Wheat Ridge, CO 80033 800-775-6745 Fax 303-423-6171

STATISTICS

NCSS 5.x Series - $125
"Best value & easiest to learn/use" PC-Week. Menus/Spreadsheet. Means, etc. Regression, t-tests, ANOVA. Factor, cluster & discriminant. Cross tabs. Nonparametrics. Histograms. Plots. Reads ASCII/Lotus. Many extra modules.

NCSS
329 North 1000 East, Kaysville, UT 84037
Phone: 801-546-0445 FAX: 801-546-3907

CIRCLE 695 ON READER SERVICE CARD

SURVEYS

The Survey System
Analyzes:marketing, public opinion, customer satisfaction, employee attitude surveys. Handles mail, personal, phone, scanner, disk-by-mail or computer interviews. Records verbatim text & voice answers. Powerful, flexible, user friendly. Free support.

Creative Research Systems
140 Vista View #100, Petaluma, CA 94952-4728
Ph.(707)765-1001/Fax (707)765-1068

CIRCLE 696 ON READER SERVICE CARD

UTILITIES

PEN PLOTTER EMULATOR
FPLOT turns your printer into an HP pen plotter. Fast hi-res, no jagged lines. Vary line width, color. Screen preview - zoom, pan. Works with most CAD programs. Supports most printers. Requires DOS 2.1 or higher. $119+$3 S&H. VISA/MC/Chk/MO.

FPLOT Corporation
24-16 Steinway St., Suite 605
Astoria, NY 11103 • 718-545-3505

CIRCLE 697 ON READER SERVICE CARD

"UNATTENDED" DOS SCHEDULING
AUTO-MIGHT PROFESSIONAL 2.0. The DOS-based Event Processor (runs time-consuming tasks unattended) and keyboard macro builder is here! Run backups, communications, etc.-Totally unattended! Many Applications $169. Free Demo

THE PENDULUM GROUP, INC.
333 W. Hampden #1015, Englewood, CO 80110
800-772-6483 303-781-0575 fax: 303-781-0562

CIRCLE 698 ON READER SERVICE CARD

AeSORT SORT SELECT/MERGE
New meaning to 'fast sort'-up to 15x faster than others. 12k size. EXE, batch, callsub from popular languages. Mult key, length. ASCN/DSCN. Output recs, key, 1NX. Different file types. Also, powerful select/merge $159.

AESORT, INC.
4070 E. Pueblo Phoenix, AZ 85040
(602)-437-2867

CIRCLE 699 ON READER SERVICE CARD

VOICE/FAX

Write your own Voice Mail software
Create advanced, multi-line voice/fax mail systems with VOS™, the Editors' Choice. Complete language for computer/telephone integration. Call for free booklet "Get into Interactive Voice".

PARITY SOFTWARE
870 Market St., #800, San Francisco, CA 94102
415-989-0330 (Fax: 415-989-0441)

WINDOWS

TAKE CONTROL OF YOUR SQL DB
Datura develops & publishes Windows based SQL tools for Oracle, SQL Server, & DB2 database servers. Desktop DBA for DB admin. - SQL Spy for DB event monitoring - SQL Port for high speed DB import/export - SQL Commander for ad-hoc query.

DATURA CORPORATION
1926 E. Parham Road, Richmond, VA 23228
804-264-1225/Fax:264-1297/CAN 416-480-1694

CIRCLE 701 ON READER SERVICE CARD

PC MAGAZINE MARKETPLACE BUSINESSCARD

BUSINESS OPPORTUNITIES

Attention Windows Developers
Your're an expert in developing programs – we're experts in marketing them.
•Windows applications, graphic content, multimedia titles.
Send evals to: IMSI Product Mgt.

Int'l. Microcomputer Software, Inc.
1938 Fourth Street, San Rafael, CA 94901
415-454-7101

CIRCLE 702 ON READER SERVICE CARD

Data Recovery Services
Data recovered from PC's, Laptops, Notebooks, PS/2's and Clones. DOS, Novell, Unix, Xenix, OS/2 & other op. systems. All drives and all failures. Training and Data Recovery software avail. Saving data since 1983.

CPR & Recovery Services
11440 Okeechobee Rd. #200 (800)765-9292
Royal Palm Bch., FL 33411 (407)586-0011

CIRCLE 708 ON READER SERVICE CARD

ON-LINE SERVICES

SHAREWARE JUKEBOX VOL I
Over 600 megabytes of shareware files! (Over 1 gigabytes uncompressed). Easy to use end user interface. Fully BBS ready (PC Board & Wildcat file listings included). Get your copy today, only $19.95 (Offer expires on Jan. 31, 1994).

6397 Little River Tnpk. Alexandria, VA 22312
Order 703-642-5121 Fax Inquiry 703-642-5122

CIRCLE 714 ON READER SERVICE CARD

DATA RECOVERY SERVICES

ONTRACK DATA RECOVERY
Ontrack is the leader in professional data recovery services - recommended by Conner, Iomega, Maxtor, Micropolis, Quantum, Rodime, Seagate, Western Digital, & others! See our ad in the Classified section for more information.

Ontrack Data Recovery
MN: 1-800-872-2599•CA: 1-800-752-7557
UK: 44-81-974-5522•Germany: 0130-815-198

CIRCLE 703 ON READER SERVICE CARD

INSURANCE

Insures Your Computer
The Computer Owners Insurance Policy provides replacement of hardware, media and purchased software. As little as $49 a yr covers theft, accidents, power surges and more! Now available in Ontario!! For info and to start coverage call:

Safeware, The Insurance Agency Inc.
PO Box 02211, 2929 N. High St.
Columbus, OH 43202 1-800-800-1492

CIRCLE 709 ON READER SERVICE CARD

SCANNING SERVICES

FOR HIRE - TYPIST – 2,400 WPM
•Fast, Accurate, Inexpensive. Overnite Svc Avail
•Any paper-docs, financials, lists, mnscripts, etc.
•Converted to file for any PC or MAC program.
•Output to diskette, CD-ROM, or tape.
•Complete Scanning/OCR/Imaging services

ScanType Service Corp.
6557 Via Barona, Carlsbad, CA 92009
(800) 597-SCAN In CALIF: (800) 300-SCAN

CIRCLE 715 ON READER SERVICE CARD

88% OF PC MAGAZINE SUBSCRIBERS PURCHASED COMPUTER PRODUCTS DIRECT IN THE PAST 12 MONTHS ...

	% OF SUBSCRIBERS
Software	79%
Peripherals	61%
Supplies	57%
Computers	48%
Networking Products	14%

Sell your products direct here, call your Marketplace account representative today at

800-825-4237

PC MAGAZINE MARKETPLACE

Advertising Sales Staff

One Park Avenue,
New York, NY 10016
212 503-5100

DISPLAY ADVERTISING

Dan Rosensweig - Associate Publisher
(212) 503-5354
Anna Zornosa - Associate Publisher/West Coast
(415) 378-5505
Lon Otremba - East Coast Advertising Director
(212) 503-4453
Bill Stephen National Sales Manager
(212) 503-5626
Ad Coordination Supervisor
Christine Holsten
(212) 503-5264
Advertising Coordinator
Julie Eigo
(212) 503-5107

NETWORK EDITION

Michael Wiener - Associate Publisher/Network Products
(415) 378-5565
Kimberly White - Eastern Advertising Manager/Network Products - Eastern Region & Midwest
(617) 393-3056
Account Representative
Allyson Deane
(212) 503-5044
Paul Klein - Western Advertising Manager/ Network Products - Western Region & Southwest
(415) 378-5546
Account Representative
Andrew Zeiger
(212) 503-5162

MA, NH, VT, ME, RI, Canada

District Sales Manager
Michael Bird (617) 393-3058
10 President's Landing, Mystic Center
Medford, MA 02155
(617) 393-3055
Account Representative
Ira Becker
(212) 503-5132

CT, NY, NJ, PA, OH

District Sales Manager
Michael Hatherill (212) 503-5128
One Park Avenue, 4th Floor
New York, NY 10016
(212) 503-5100
District Sales Manager
Lisa Friedman
(212) 503-5149

DE, MD, DC, VA, WV, NC, SC, AL, MS, TN, AR, KY, GA, FL

District Sales Manager
Frank Quigley (404) 814-8950
3405 Piedmont Road, Suite 460
Atlanta, GA 30305
(404) 814-8940
Account Representative
Robert Regan
(212) 503-5032

NE, WI, IL, IN, KS, MN, MO, MI, IA, ND, SD

District Sales Manager
Ken Beach
(312) 214-7330
150 North Wacker Drive, 25th Floor
Chicago, IL 60606
(312) 214-7300
Sr. Account Representative
Beth Boyle
(212) 503-5047

TX, OK, LA, NM

District Sales Manager
Todd Anderman (214) 360-5725
5956 Sherry Lane, Suite 625
Dallas, TX 75225
(214) 360-5725
Sr. Account Representative
Stephanie Brzozowski
(212) 503-5675

Mark Malloy - Southwest Area Manager
(213) 351-1860

CA (San Diego & Orange County), AZ, HI, CA (Los Angeles)

District Sales Manager
David Lynn (714) 852-5924
18301 Von Karman Avenue, Suite 330
Irvine, CA 92715
(714) 852-5914
District Sales Manager
Robin Kofsky
(714) 852-5920
Sr. Account Representative
Alysa Parisi
(212) 503-5113
Account Representative
Elizabeth O'Connor
(212) 503-5040

CA (San Jose)

District Sales Manager
Michael Klein (415) 378-5521
110 Marsh Drive, Suite 103
Foster City, CA 94404
(415) 378-5520

Account Representative
Adam Power
(212) 503-5663

Mike Kisseberth - Northwest Area Manager
(415) 378-5510

CA (San Francisco & North), ID, OR, WA, NV

110 Marsh Drive, Suite 103
Foster City, CA 94404
(415) 378-5520

Account Representative
Jeff Green
(212) 503-5129

CA (South San Francisco to Mountainview), CO, UT, WY, AK, MT

District Sales Manager
Kristy Newton (415) 378-6859
110 Marsh Drive, Suite 103
Foster City, CA 94404
(415) 378-5520

Account Representative
Tim Castelli
(212) 503-5125

For more information regarding *display* advertising please call:
212 503-5100
1-800-33MAG AD

CENTRAL ADVERTISING

VP, Central Advertising
Robert A. Bader

Director of Sales & Marketing
Paul Fusco

Sales Manager
Monte Wasch

Production Director
Vicki Egan

Sr. Production Coordinator
Nadine Messier

Production Coordinator
Berhan Asmarom

Advertising Coordinator
Courtnay Ozanne

AL, AR, FL, GA, LA, MS, NC, SC, TN, TX, VA

Account Manager
Leslie Eddy (South East)
(212) 503-5171

AK, AZ, CA (209, 213, 310, 619, 714, 805, 818, 909), CN, NM, OK, HI, Foreign

Account Representative
Carolyn Goldfarb
(212) 503-5076

CT, IA, IL, IN, ME, MI, NH, NJ, MI, RI, VT, WI

Account Representative
Bill Herbst
(212) 503-5193

CA (209, 408, 410, 415, 707, 916)

Account Representative
R.J. Kirkland
(212) 503-5118

DC, NY, PA, DE, MD, OH, WV, KY

Account Representative
Andrew Kramer
(212) 503-5150

CO, ID, KS, MN, MO, MT, ND, NE, NV, OR, SD, UT, WA, WY

Account Representative
Maggie Hewitt
(212) 503-5156

Business Card Account Representative
Call: 1-800-825-4237
PC Magazine Marketplace
3rd Floor, One Park Ave.
New York, NY 10016

For more information regarding *central* advertising please call:
212 508-5115
1-800-825-4237

Q: What's the best value for your marketing dollar?

A: Reprints, of course!

Dollar for dollar, you just can't beat a reprint of a great review; and there's never been a better time to order. Faster turnaround times and price incentives make this a great time to have your product review or advertisement reprinted. Why not call today? It really makes "cents!"

Contact: Marcia Hazell (212) 503-5412

Carol Peters, Reprints Manager; Ziff-Davis Publishing Company.

ZIFF-DAVIS REPRINTS

ONE PARK AVENUE 16th FLOOR NEW YORK NEW YORK 10016

Advertisers' Index
COMPANIES

Reader Service No.	Advertiser	Page
110	3 Com Corporation	74-75
874	3 Com Corporation	NE20-NE21
910	3M Data Storage Products	69
034	Acer America	81-85
226	ADI Systems Inc	45
368	Adobe Systems Inc	183
*	AMBRA COMPUTER CORPORATION	106-109
*	AMBRA COMPUTER CORPORATION	118-119
915	American Power Conversion	NE19
025	American Small Business Computers	363
235	AMS	350
336	Arlington Computer Products	330-331
*	AST Research	20-21
127	ATI Technologies Inc	13
325	Austin Computer Systems	101
012	Austin Computer Systems	143-145
156	Austin Computer Systems	224-225
318	Aztech Labs, Inc	228
285	Borland International	6
220	Borland International	53
328	Buffalo Products	229
015	Bulldog Computer Products	368
292	Caere Corporation	41
097	Caere Corporation	70-71
341	Calera Recognition System	36
934	Cameo Communications, Inc	271
*	Chipsoft Inc	239
*	Communication Intelligence	16-17
308	Compaq Computer Corporation	148-149
*	Compaq Computer Corporation	242-243
*	Compaq Computer Corporation	245
137	Compaq Computer Corporation	272-273
126	CompuAdd	197-199
144	Compudyne	102-103
300	Computability	316-317
348	Computer Associates	2-3
075	Computer Associates	5
193	Computer Associates	43
159	COMPUTER DISCOUNT WAREHOUSE	323
109	COMPUTER DISCOUNT WAREHOUSE	324-325
360	COMPUTER DISCOUNT WAREHOUSE	326-327
158	Computer Library	376
316	Comtrade	318-319
185	CONNEXPERTS	47
011	Corel Corporation	18
908	Corel Corporation	NE24
329	CTX International	280
932	Datapoint Corporation	NE22
901	DCA	260
*	DEE ONE SYSTEMS	329
*	Dell Computer Corporation	C5-C8
*	Dell Computer Corporation	310-311
250	Delrina Technology	72
854	DIGIBOARD	NE12
049	Digital Equipment Corporation	207-214
930	Digital Equipment Corporation	NE2-NE3
931	Digital Equipment Corporation	NE16-NE17
347	DUSTIN DISCOUNT SOFTWARE	315
*	Epson America	10-11
003	ExpoTech/VTech	332
305	ExpoTech/VTech	342-347
014	First Source International	348-349
925	Fluke Corporation	NE11
*	Gateway 2000	48-49
*	Gateway 2000	140-141
*	Gateway 2000	48a-x
277	Global Horizons, Inc	369
391	H.Co Memory Upgrades	358
933	Hayes Microcomputer Products	139
*	Hewlett Packard Peripheral Group	96-97
942	Hewlett Packard	NE7
*	IBM Corporation	23
*	IBM Corporation	165-168
*	IBM Corporation	237
*	IBM Networking Systems	256-257
*	IBM Personal Software Products	187
390	In-Focus	279
052	Inmac	231-234
219	Insight Distribution Network	333-335
*	Intel Corporation	171-174
882	Intel Corporation	NE5
048	Intergraph Corp	76-77
378	Iomega	191
242	Kenosha Computer Center	352
106	Kingston Technology	98
019	L.A. Trade	364
*	Lotus Development Corporation	33
*	Lotus Development Corporation	89-91
067	Mag Innovision	275
365	Manugistics	192
337	Media Vision	86
093	Media Vision	158
272	Media Vision	185
130	Media Vision	284
018	MegaHaus	336
383	Memory Direct	370
855	Micro Solutions Computer Products	153
862	Microcom	NE32
361	Micrografx	55
119	Micron Computer, Inc	123-126
914	Micropolis Corporation	NE29
*	Microsoft	C2-C4,p1
*	Microsoft	104
*	Microsoft	NE8-NE9
013	Microtac Software	78
225	MicroWarehouse	371
010	Midwest Computer Works	366-367
398	Midwest Micro	337-341
879	MiLAN Technology Corporation	NE15
338	Motorola - Semi Conductor	64-65
283	Nanao Corporation	296
*	NCR Corporation	151-154
153	NEC Technologies	26-27
878	Network Express	365
346	Norton Lambert	63
056	Okidata	181
223	Optical Coating Laboratory Inc	190
*	PC Connection	218-221
080	PC Power & Cooling	67
076	PC Power & Cooling	100
238	PCs Compleat	359
092	PCs Compleat	360-361
358	Peachtree Software	201
026	Personics	4
098	Pinnacle Micro	321
148	Primavera Systems	60
865	Rose Electronics	NE34
856	Saber Software	NE26-NE27
006	ShapeWare	160
161	Sharp Electronics Corp	290
150	SmartPrint/Dresselhaus	189
377	Sony Recording Media	57
057	StatSoft	59
279	SyDOS	94
334	Symantec Corporation	28
880	SynOptics Communications	266-269
112	TDK	176
353	Texas Instruments	114-115
857	Thomas Conrad Corporation	NE30
379	Toshiba America	178-179
920	US Robotics Inc	246
065	USA Flex	353
210	USA Flex	354-355
055	USA Flex	356-357
343	Valueline	351
121	Velocity Development Corporation	283
*	WordPerfect Corporation	14-15
211	Xircom	251
036	Zeos Int'l	24-25
038	Zeos Int'l	34-35
063	Zeos Int'l	92
155	Zeos Int'l	129-134
125	Zeos Int'l	137
385	ZiffNet	375

* No Reader Service #. Please Call Advertiser For Information.

Advertisers' Index
PRODUCTS

Reader Service No.	Company	Product	Page
	ACCOUNTING SOFTWARE		
348	Computer Associates	ACCPAC PLUS	2-3
358	Peachtree Software	Accounting Software	201
	ADD-ON BOARDS		
127	ATI Technologies Inc.	ATI Graphics Accelerators	13
325	Austin Computer Systems	Audio Boards & Sound Systems	101
318	Aztech Labs, Inc.	Sound Galaxy NX Pro 16	228
015	Bulldog Computer Products	Hardware/Peripherals	368
014	First Source International	Memory	348-349
337	Media Vision	Pro AudioStudio 16	86
093	Media Vision	Fusion Double CD 16	158
130	Media Vision	Media Vision Sound Family	284
	BACKUP SOFTWARE		
855	Micro Solutions Computer Products	Tape Backup	159
	CAD/CAM		
048	Intergraph Corp	MicroStation	76-77
	CD-RO		
025	American Small Business Computers	DesignCAD	363
015	Bulldog Computer Products	Hardware/Peripherals	368
300	Computability	Mail Order	316-317
158	Computer Library	Computer Select	376
219	Insight Distribution Network	CD ROM	333-335
093	Media Vision	Fusion Double CD 16	158
130	Media Vision	Media Vision Sound Family	284
855	Micro Solutions Computer Products	CD ROM	159
112	TDK	TDK Recordable Compact Discs	176
343	Valueline	Mail Order/Peripherals	351
	CHIPS/PROCESSORS		
•	Intel Corporation	Performance Measurement	171-174
106	Kingston Technology	Processor Upgrades	98
338	Motorola - Semi Conductor	Power PC	64-65
	COMMUNICATIONS SOFTWARE		
901	DCA	Workstation IWW	260
250	Delrina Technology	Communication Suite	72
862	Microcom	Carbon Copy	NE32
	COMPUTERS/COMPATIBLES		
034	Acer America	Systems	81-85
•	AMBRA COMPUTER CORPORATION	PC's and Notebooks	106-109
•	AMBRA COMPUTER CORPORATION	PC's and Notebooks	118-119
336	Arlington Computer Products	Mail Order/Peripherals	330-331
•	AST Research	Premia	20-21
308	Compaq Computer Corporation	Desktops	148-149
•	Compaq Computer Corporation	Desktops and Cortina Bundle	242-243
•	Compaq Computer Corporation	Desktops and Cortina Bundle	245
137	Compaq Computer Corporation	Desktops	272-273
126	CompuAdd	CompuAdd Systems	197-199
144	Compudyne	Compudyne Desktops & Notebooks	102-103
316	Comtrade	Systems	318-319
•	DEE ONE SYSTEMS	Systems	329
•	Dell Computer Corporation	Dell Systems	C5-C8
•	Dell Computer Corporation	Dell Systems	310-311
049	Digital Equipment Corporation	Systems	207-214
003	ExpoTech/VTech	Notebooks	332
305	ExpoTech/VTech	486 DX2/50 Mhz, 486 SX/25 Mhz	342-347
•	Gateway 2000	PCs	48-49
•	Gateway 2000	Pentium PC	140-141
•	Gateway 2000	PCs	48a-x
277	Global Horizons, Inc.	Systems/Software/Peripherals	369
•	IBM Corporation	PS/Valuepoint	165-168
052	Inmac	Systems	231-234
219	Insight Distribution Network	Mail Order Systems	333-335
119	Micron Computer, Inc.	Micron PCs	123-126
010	Midwest Computer Works	PCs	366-367
398	Midwest Micro	Desktop Systems	337-341
•	NCR Corporation	Systems	151-154
238	PCs Compleat	Computers	359
092	PCs Compleat	Computers	360-361
065	USA Flex	Desktop PCs	353
210	USA Flex	Desktop PCs	354-355
055	USA Flex	Desktop PCs	356-357
343	Valueline	Mail Order/Peripherals	351
038	Zeos Int'l	EISA/AMBRA	34-35
155	Zeos Int'l	Zeos Upgradables	129-134
125	Zeos Int'l	Pentium	137
	DATA BASE MANAGERS		
285	Borland International	Paradox	6
•	Lotus Development Corporation	Lotus SmartSuite	90-91
•	Microsoft	Microsoft Office	C2-C4,p1
026	Personics	Monarch	4
	DATA ENTRY SOFTWARE		
365	Manugistics	Statgraphics Plus	192
	DESK TOP PUBLISHING		
075	Computer Associates	CA-RET/Xbase	5
	DISK BACKUP & TAPE DRIVES		
910	3M Data Storage Products	3M Data Storage Products	69
300	Computability	Mail Order	316-317
378	Iomega	Bernoulli Drive	191
018	MegaHaus	Drives/Storage	336
855	Micro Solutions Computer Products	Tape Backup	159
914	Micropolis Corporation	Raidion	NE29
343	Valueline	Mail Order/Peripherals	351
	DISKETTES		
377	Sony Recording Media	SONY 2120 Data Cartridges	57
112	TDK	TDK Data Cartridges	176
112	TDK	TDK Floppy Disks	176
	DISPLAYS/MONITORS/TERMINALS		
226	ADI Systems Inc	Monitors	45
015	Bulldog Computer Products	Hardware/Peripherals	368
329	CTX International	Monitors	280
•	DEE ONE SYSTEMS	Monitors	329
390	In-Focus	PanelBook 450	279
067	Mag Innovision	Monitors	275
283	Nanao Corporation	Monitors	296
223	Optical Coating Laboratory Inc.	Glare Guard Screen Filters	190
343	Valueline	Mail Order/Peripherals	351
	ELECTRONIC MAIL		
•	Lotus Development Corporation	Lotus Notes	33
•	Lotus Development Corporation	Lotus SmartSuite	90-91
•	Microsoft	Microsoft Mail	NE8-NE9
•	WordPerfect Corporation	WordPerfect Office 4.0	14-15
	EMULATORS/PROTOCOL CONVERTERS		
901	DCA	Workstation IWW	260
920	US Robotics Inc	TOTAL CONTROL	246
	FILE SYSTEMS & ACCESS METHODS		
292	Caere Corporation	Fax and Find	41
	FOREIGN SOFTWARE		
013	Microtac Software	Spanish Assistant for Windows	78
	GRAPHICS SOFTWARE		
368	Adobe Systems Inc	Adobe Illustrator	183
292	Caere Corporation	Fax and Find	41
011	Corel Corporation	Corel Draw 4.0	18
•	Lotus Development Corporation	Lotus SmartSuite	90-91
361	Micrografx	Designer	55
010	Midwest Computer Works	Hardware/PCs/Monitors	366-367
006	ShapeWare	Visio 2.0	160
	HARD DISKS		
300	Computability	Mail Order	316-317
•	DEE ONE SYSTEMS	Hard Drives	329
219	Insight Distribution Network	Hard Drives	333-335
018	MegaHaus	Drives/Storage	336
855	Micro Solutions Computer Products	Tape Backup/Disk Drives	159
914	Micropolis Corporation	Raidion	NE29
279	SyDOS	Marlin/Puma	94
	HARDWARE		
159	COMPUTER DISCOUNT WAREHOUSE	Hardware	323
109	COMPUTER DISCOUNT WAREHOUSE	Hardware	324-325
360	COMPUTER DISCOUNT WAREHOUSE	Hardware	326-327
854	DIGIBOARD	Internetworking Solutions	NE12
930	Digital Equipment Corporation	Hubs	NE2-NE3
052	Inmac	Systems	231-234
106	Kingston Technology	Processor Upgrades	98
010	Midwest Computer Works	Hardware	366-367
398	Midwest Micro	Notebooks, Desktop Systems	337-341
211	Xircom	Pocket LAN Adapter	251
	INPUT DEVICES		
•	Communication Intelligence	Handwriter for Windows	16-17
	INTEGRATED SOFTWARE		
•	Lotus Development Corporation	Lotus SmartSuite	90-91
856	Saber Software	Saber LAN Workstation	NE26-NE27
	LAN ADAPTER BOARDS		
109	COMPUTER DISCOUNT WAREHOUSE	Network Products	324-325
185	CONNEXPERTS	The NET Solution	47
932	Datapoint Corporation	ARCNETPLUS	NE22
854	DIGIBOARD	Multiport Serial Boards	NE12
878	Network Express	Network Mail Order	365
865	Rose Electronics	MicroServ & LANJet	NE34
	LOCAL AREA NETWORKING		
110	3 Com Corporation	Parallel Tasking	74-75
874	3 Com Corporation	Token Ring Solutions	NE20-NE21
934	Cameo Communications, Inc	Hubs	271
300	Computability	Mail Order	316-317
159	COMPUTER DISCOUNT WAREHOUSE	Networking Products	323
360	COMPUTER DISCOUNT WAREHOUSE	Networking Products	326-327
185	CONNEXPERTS	The NET Solution	47
932	Datapoint Corporation	ARCNETPLUS	NE22
901	DCA	Workstation IWW	260
930	Digital Equipment Corporation	Hubs	NE2-NE3
942	Hewlett Packard	Paper Feeders	NE7
•	IBM Networking Systems	Family Adapter Cards	256-257
882	Intel Corporation	LANDesk Manager	NE5
862	Microcom	Carbon Copy	NE32
879	MiLAN Technology Corporation	FastPort	NE15
878	Network Express	Network Mail Order	365
865	Rose Electronics	MicroServ & LANJet	NE34
856	Saber Software	Saber LAN Workstation	NE26-NE27
880	SynOptics Communications	LattiSphere Family	266-269
857	Thomas Conrad Corporation	100Mbps Networking Products	NE30
•	WordPerfect Corporation	WordPerfect Office 4.0	14-15
211	Xircom	Pocket LAN Adapter	251
	MAIL ORDER		
034	Acer America	Systems	81-85
•	AMBRA COMPUTER CORPORATION	PC's and Notebooks	106-109
•	AMBRA COMPUTER CORPORATION	PC's and Notebooks	118-119
025	American Small Business Computers	DesignCAD	363
235	AMS	Notebooks	350
336	Arlington Computer Products	Mail Order	330-331

Advertisers' Index
PRODUCTS

Reader Service No.	Company	Product	Page
325	Austin Computer Systems	Audio Boards & Sound Systems	101
012	Austin Computer Systems	Austin Desktops	143-145
156	Austin Computer Systems	Austin Notebooks	224-225
015	Bulldog Computer Products	Mail Order	368
•	Compaq Computer Corporation	Desktops and Cortina Bundle	242-243
•	Compaq Computer Corporation	Desktops and Cortina Bundle	245
126	CompuAdd	CompuAdd Systems	197-199
144	Compudyne	Compudyne Desktops & Notebooks	102-103
316	Comtrade	Mail Order	318-319
049	Digital Equipment Corporation	Systems	207-214
347	DUSTIN DISCOUNT SOFTWARE	Mail Order	315
305	ExpoTech/VTech	486 DX2/50 Mhz, 486 SX/25 Mhz	342-347
014	First Source International	Memory	348-349
•	Gateway 2000	Mail Order	48-49
•	Gateway 2000	Mail Order	48a-x
277	Global Horizons, Inc.	Systems/Software/Peripherals	369
•	IBM Corporation	PS/Valuepoint	165-168
052	Inmac	Systems	231-234
219	Insight Distribution Network	Mail Order	333-335
242	Kenosha Computer Center	Mail Order	352
019	L.A. Trade	Memory	364
130	Media Vision	Media Vision Sound Family	284
018	MegaHaus	Drives/Storage	336
383	Memory Direct	Memory	370
119	Micron Computer, Inc.	Micron PCs	123-126
225	MicroWarehouse	Mail Order Reseller	371
010	Midwest Computer Works	Mail Order	366-367
878	Network Express	Network Mail Order	365
•	PC Connection	Mail Order	218-221
238	PCs Compleat	Mail Order	359
092	PCs Compleat	Mail Order	360-361
057	StatSoft	Statistical Software	59
065	USA Flex	Notebooks/PCs/Printers	353
210	USA Flex	Notebooks/PCs/Printers	354-355
055	USA Flex	Notebooks/PCs/Printers	356-357
343	Valueline	Mail Order/Peripherals	351
036	Zeos Int'l	Freestyle/Contenda	24-25
038	Zeos Int'l	EISA/AMBRA	34-35
063	Zeos Int'l	Zeos Colomote	92
155	Zeos Int'l	Zeos Upgradables	129-134
125	Zeos Int'l	Pentium	137
	MASS STORAGE		
300	Computability	Mail Order	316-317
378	Iomega	Bernoulli Drive	191
018	MegaHaus	Drives/Storage	336
914	Micropolis Corporation	Raidon	NE29
279	SyDOS	Marlin/Puma	94
	MEMORY		
014	First Source International	Memory	348-349
391	H Co Memory Upgrades	Memory	358
019	L.A. Trade	Memory	364
383	Memory Direct	Memory	370
	MICRO-MAINFRAME LINKS		
901	DCA	Workstation IWW	260
	MISCELLANEOUS		
925	Fluke Corporation	670 LAN Meter Network Tester	NE11
	MODEMS		
300	Computability	Mail Order	316-317
933	Hayes Microcomputer Products	Optima	139
920	US Robotics Inc	TOTAL CONTROL	246
	MULTI-MEDIA		
325	Austin Computer Systems	Audio Boards & Sound Systems	101
318	Aztech Labs, Inc.	Sound Galaxy NX Pro 16	228
219	Insight Distribution Network	Multimedia	334-335
337	Media Vision	Pro AudioStudio 16	86
093	Media Vision	Fusion Double CD 16	158
130	Media Vision	Media Vision Sound Family	284
	OCR PRODUCTS		
097	Caere Corporation	OmniPage	70-71
341	Calera Recognition System	WordScan Plus 2.0	36
	ON LINE DATABASE		
385	ZiffNet	ZiffNet	375
	OPERATING SYSTEMS/ENVIRONMENTS		
•	IBM Personal Software Products	OS/2	187
•	Microsoft	Microsoft Windows NT	104
	OPTICAL PERIPHERALS		
098	Pinnacle Micro	Tahoe Optical Drives	321
	PC ACCESSORIES		
925	Fluke Corporation	670 LAN Meter Network Tester	NE11
390	In-Focus	PanelBook 450	279
855	Micro Solutions Computer Products	Tape Backup/CDROM/Disk Drives	159
223	Optical Coating Laboratory Inc	Glare Guard Screen Filters	190
	PC DIRECT		
025	American Small Business Computers	DesignCAD	363
235	AMS	Notebooks	350
336	Arlington Computer Products	Mail Order/Peripherals	330-331
015	Bulldog Computer Products	Hardware/Peripheral/Mail Order	368
300	Computability	Mail Order	316-317
159	COMPUTER DISCOUNT WAREHOUSE	Mail Order	323
109	COMPUTER DISCOUNT WAREHOUSE	Mail Order	324-325
360	COMPUTER DISCOUNT WAREHOUSE	Mail Order	326-327
316	Comtrade	Systems, Mail Order	318-319
•	DEE ONE SYSTEMS	Mail Order	329
347	DUSTIN DISCOUNT SOFTWARE	Mail Order	315
003	ExpoTech/VTech	Notebooks	332
305	ExpoTech/VTech	486 DX2/50 Mhz, 486 SX/25 Mhz	342-347
014	First Source International	Memory	348-349
277	Global Horizons, Inc.	Systems/Software/Peripherals	369
391	H Co Memory Upgrades	Memory	358
219	Insight Distribution Network	PCs/CDROM/Multimedia/Hard Drive	334-335
242	Kenosha Computer Center	Mail Order	352
019	L.A. Trade	Memory	364
018	MegaHaus	Drives/Storage	336
383	Memory Direct	Memory	370
225	MicroWarehouse	Mail Order Reseller	371
010	Midwest Computer Works	Hardware/PCs/Monitors	366-367
398	Midwest Micro	Mail Order	337-341
878	Network Express	Network Mail Order	365
092	PCs Compleat	Computers, Mail Order	360-361
098	Pinnacle Micro	Tahoe Optical Drives	321
065	USA Flex	Notebooks/PCs/Printers	353
210	USA Flex	Notebooks/PCs/Printers	354-355
055	USA Flex	Notebooks/PCs/Printers	356-357
343	Valueline	Mail Order/Peripherals	351
	PERIPHERAL SHARING DEVICE		
328	Buffalo Products	Printer Sharing	229
908	Corel Corporation	SCSI NET	NE24
865	Rose Electronics	MicroServ & LANJet	NE34
150	SmartPrint/Dresselhaus	SmartPrint	189
	PERIPHERALS		
336	Arlington Computer Products	Peripherals	330-331
159	COMPUTER DISCOUNT WAREHOUSE	Peripherals	323
109	COMPUTER DISCOUNT WAREHOUSE	Peripherals	324-325
360	COMPUTER DISCOUNT WAREHOUSE	Peripherals	326-327
•	DEE ONE SYSTEMS	Peripherals	329
•	Gateway 2000	Peripherals	48-49
•	Gateway 2000	Peripherals	48a-x
398	Midwest Micro	Peripherals	337-341
878	Network Express	Network Mail Order	365
065	USA Flex	Peripherals	353
210	USA Flex	Peripherals	354-355
055	USA Flex	Peripherals	356-357
211	Xircom	Pocket LaN Adapter	251
	PORTABLE/LAP COMPUTERS		
034	Acer America	Systems	81-85
•	AMBRA COMPUTER CORPORATION	PC's and Notebooks	106-109
•	AMBRA COMPUTER CORPORATION	PC's and Notebooks	118-119
235	AMS	Notebooks	350
012	Austin Computer Systems	Austin Desktops	143-145
156	Austin Computer Systems	Austin Notebooks	224-225
308	Compaq Computer Corporation	Desktops	148-149
•	Compaq Computer Corporation	Desktops and Cortina Bundle	242-243
•	Compaq Computer Corporation	Desktops and Cortina Bundle	245
144	Compudyne	Compudyne Desktops & Notebooks	102-103
159	COMPUTER DISCOUNT WAREHOUSE	Laptops	323
109	COMPUTER DISCOUNT WAREHOUSE	Laptops	324-325
360	COMPUTER DISCOUNT WAREHOUSE	Laptops	326-327
003	ExpoTech/VTech	Notebooks	332
305	ExpoTech/VTech	486 DX2/50 Mhz, 486 SX/25 Mhz	342-347
•	Gateway 2000	Notebooks	48-49
•	Gateway 2000	Notebooks	48a-x
277	Global Horizons, Inc.	Systems/Software/Peripherals	369
398	Midwest Micro	Notebooks	337-341
•	NCR Corporation	Notebooks	151-154
379	Toshiba America	Notebooks	178-179
065	USA Flex	Notebooks	353
210	USA Flex	Notebooks	354-355
055	USA Flex	Notebooks	356-357
036	Zeos Int'l	Freestyle/Contenda	24-25
063	Zeos Int'l	Zeos Colomote	92
125	Zeos Int'l	Pentium	137
	POWER PROTECTION		
915	American Power Conversion	BACKUPS	NE19
080	PC Power & Cooling	PowerProtection/CoolingDevices	67
076	PC Power & Cooling	110 Alert	100
	PRESENTATION SOFTWARE		
•	Microsoft	Microsoft Office	C2-C4,p1
	PRINTER ACCESSORIES		
942	Hewlett Packard	Paper Feeders	NE7
150	SmartPrint/Dresselhaus	SmartPrint	189
065	USA Flex	Peripherals/Printers	353
210	USA Flex	Peripherals/Printers	354-355
055	USA Flex	Peripherals/Printers	356-357
	PRINTERS		
300	Computability	Mail Order	316-317
931	Digital Equipment Corporation	DEC Printers	NE16-NE17
153	NEC Technologies	610 Superscript	26-27
056	Okidata	DOC-IT	181
161	Sharp Electronics Corp	Sharp JX-9460 PS	256
353	Texas Instruments	MicroLaser Printers	114-115
065	USA Flex	Printers	353
210	USA Flex	Printers	354-355
055	USA Flex	Printers	356-357
	PROGRAM DEVELOPERS/GENERATORS		
•	IBM Corporation	C Set + + First Step	23
•	IBM Corporation	C Set + + v2.1	237
	PROGRAMMERS TOOLS UTILITIES		
•	IBM Corporation	C Set + + First Step	23
•	IBM Corporation	C Set + + v2.1	237

Advertisers' Index
PRODUCTS

Reader Service No.	Company	Product	Page
	PROJECT MANAGEMENT		
193	Computer Associates	SuperProject	43
148	Primavera Systems	Project Management	60
	REMOTE COMPUTING		
346	Norton Lambert	Close-Up 5.0	63
920	US Robotics Inc	TOTAL CONTROL	246
	RESELLERS		
159	COMPUTER DISCOUNT WAREHOUSE	Reseller	323
109	COMPUTER DISCOUNT WAREHOUSE	Reseller	324-325
360	COMPUTER DISCOUNT WAREHOUSE	Reseller	326-327
347	DUSTIN DISCOUNT SOFTWARE	Mail Order	315
277	Global Horizons, Inc.	Systems/Software/Peripherals	369
018	MegaHaus	Drives/Storage	336
383	Memory Direct	Memory	370
225	MicroWarehouse	Mail Order Reseller	371
010	Midwest Computer Works	Reseller	366-367
	SCANNERS/DIGITIZERS		
*	Epson America	Epson 600 dpi Scanner	10-11
*	Hewlett Packard Peripheral Group	HP ScanJet IIcx	96-97
056	Okidata	DOC-IT	181
	SECURITY		
076	PC Power & Cooling	110 Alert	100
	SERVERS		
878	Network Express	Network Mail Order	365
	SERVICE/SUPPORT		
385	ZiffNet	ZiffNet	375
	SOFTWARE		
300	Computability	Mail Order	316-317
348	Computer Associates	ACCPAC PLUS	2-3
901	DCA	Workstation IWW	260
347	DUSTIN DISCOUNT SOFTWARE	Mail Order	315
*	IBM Corporation	C Set + + First Step	23
*	IBM Corporation	C Set + + v2.1	237
046	Intergraph Corp	MicroStation	76-77
365	Manugistics	Statgraphics Plus	192
*	Microsoft	Microsoft Windows NT	104
346	Norton Lambert	Close-Up 5.0	63
358	Peachtree Software	Accounting Software	201
148	Primavera Systems	Project Management	60
121	Velocity Development Corporation	Remind Me! for Windows	283
	SPREADSHEET TEMPLATES		
220	Borland International	Quattro Pro	53
*	Lotus Development Corporation	Lotus SmartSuite	90-91
*	Microsoft	Microsoft Office	C2-C4,p1
	STATISTICAL SOFTWARE		
365	Manugistics	Statgraphics Plus	192
057	StatSoft	Statistical Software	59
	TAX SOFTWARE		
*	Chipsoft Inc	Turbo Tax	239
	TIME MANAGEMENT SOFTWARE		
121	Velocity Development Corporation	Remind Me! for Windows	283
	UTILITIES		
346	Norton Lambert	Close-Up 5.0	63
334	Symantec Corporation	Norton Utilities	28
	VERTICAL MARKET SOFTWARE		
365	Manugistics	Statgraphics Plus	192
	VIDEO GRAPHICS BOARDS		
127	ATI Technologies Inc.	ATI Graphics Accelerators	13
300	Computability	Mail Order	316-317
*	DEE ONE SYSTEMS	Video Cards	329
272	Media Vision	Pro Graphics 1024	185
	WINDOWS SOFTWARE		
368	Adobe Systems Inc	Adobe Illustrator	183
025	American Small Business Computers	DesignCAD	363
285	Borland International	Paradox	6
220	Borland International	Quattro Pro	53
341	Calera Recognition System	WordScan Plus 2.0	36
075	Computer Associates	CA-RET/Xbase	5
193	Computer Associates	SuperProject	43
011	Corel Corporation	Corel Draw 4.0	18
250	Delrina Technology	Communication Suite	72
*	Lotus Development Corporation	Lotus Notes	33
*	Lotus Development Corporation	Lotus SmartSuite	89-91
365	Manugistics	Statgraphics Plus	192
361	Micrografx	Designer	55
*	Microsoft	Microsoft Office	C2-C4,p1
*	Microsoft	Microsoft Windows NT	104
*	Microsoft	Microsoft Mail	NE8-NE9
013	Microtac Software	Spanish Assistant for Windows	78
346	Norton Lambert	Close-Up 5.0	63
358	Peachtree Software	Accounting Software	201
856	Saber Software	Saber LAN Workstation	NE26-NE27
006	ShapeWare	Visio 2.0	160
057	StatSoft	Statistical Software	59
121	Velocity Development Corporation	Remind Me! for Windows	283
*	WordPerfect Corporation	WordPerfect Office 4.0	14-15
	WORD PROCESSING SOFTWARE AIDS		
*	Microsoft	Microsoft Office	C2-C4,p1
013	Microtac Software	Spanish Assistant for Windows	78

For Additional Categories See MARKETPLACE PRODUCT INDEX page 377.

PC MAGAZINE

Coming Up

Applications Integration

After years of paying lip service to software integration, vendors are finally shipping products that make the concept work. But are we really there yet? This three-part report surveys the state of the art in applications integration.

Getting It Together As the walls between applications tumble down, some basic concepts are in for a shake-up. New object-linking standards put documents—not programs—at center stage. Software suites are making strides toward integration, while networkable objects extend collaboration across the workgroup. Innovations like "exposed objects" can even turn your commercial apps into reusable code.

Suite Deals As sales of software suites go through the roof, vendors scramble to integrate their offerings. While common user interfaces, shared-code modules, uniform macro languages, and workgroup integration are everyone's goal, some products are closer than others. We test the three leading software suites, both as integrated products and as collections of individual apps.

Cross-Application Macro Languages Macro languages go back to the days of DOS, but Windows has spawned a whole new generation of power tools. We review six high-end macro products for automating vertical tasks using off-the-shelf Windows apps.

Color Desktop Scanners

Color scanners are getting better, more affordable, and easier to operate. Many offer single-pass scanning, SCSI interfaces, and Twain drivers. Here are 21 color desktop scanners that can handle 24-bit color and 300 by 600 dots per inch; some even interpolate resolutions up to 2,400 dpi.

Getting On-Line

What are you missing if you're not on-line? And what does this have to do with the information superhighway? We'll tell you about not only the many services and sources of information that await you but how to get there from here. Find out what you can do with your modem besides sending files to the office.

Free Utility

Have you ever wanted to save multiple versions of a file but didn't want the hassle of managing multiple directories or filenames? Next month's free Windows utility, VULCAN, lets you keep multiple versions of a file by dragging one or more files from the Windows File Manager to an icon on your desktop.

Editorial Product Index

Reader Service No.	Product	Company	Page
493	AccuSoft Image Format Library, Version 4.0	AccuSoft Corp.	289
441	AcerPower Series 9000	Acer America Corp.	120
452	Adobe Illustrator for Windows, Version 4.01	Adobe Systems Inc.	164
442	ALR Evolution V	Advanced Logic Research Inc.	121
421	ALR Evolution V ST	Advanced Logic Research Inc.	66
443	American Multisystems InfoGold Pentium 60 NT	American Multisystems	121
435	Apple LaserWriter Pro 810	Apple Computer Inc.	44
435	Apple LaserWriter Select 360	Apple Computer Inc.	44
479	AsanteHub 1012	Asante Technologies Inc.	255
425	Autodesk 3D Studio Release 3	Autodesk Inc.	58
469	B.A.B.Y.	Software Marketing Corp.	412
470	Babydoc In A Disk	Babydoc Publishing Co.	412
460	BestBooks, Version 1.0	Teleware Inc.	200
462	CA-Simply Accounting for Windows, Version 2.0	Computer Associates International Inc.	202
480	Cabletron SEH-24	Cabletron Systems Inc.	259
453	Canvas for Windows, Version 3.5	Deneba Software	177
461	CashBIZ, Version 1.0	M-USA Business Systems	202
401	The Children's Machine: Rethinking School in the Age of the Computer	BasicBooks	73
444	Compaq Deskpro 5/60M	Compaq Computer Corp.	127
415	Compaq Deskpro XE	Compaq Computer Corp.	61
415	Compaq Presario 633 CDS	Compaq Computer Corp.	61
415	Compaq Presario 800	Compaq Computer Corp.	61
434	Compaq ProLiant 2000	Compaq Computer Corp.	46
415	Compaq ProLinea MT	Compaq Computer Corp.	61
415	Compaq ProLinea Net1/25s	Compaq Computer Corp.	61
482	Compex TP3000	Compex Inc.	262
454	CorelDRAW, Version 4.0	Corel Corp.	186
403	The Create-It Kit: Desktop Publishing for Kids Age 7 and Up	Random House	73
422	dBASE Compiler for DOS 2.0	Borland International Inc.	68
436	Dell Dimension XPS P60	Dell Computer Corp.	68
414	DesignCAD Windows	American Small Business Computers Inc.	61
483	D-Link DE-1200	D-Link Systems Inc.	265
463	Do-It-Yourself Accounting, Version 3.21	Central Computer Products	203
456	Dollars & Sense, Version 3.4	Software Developers Consortium	238
475	Eight Ball Deluxe	Amtex Software Corp.	412
478	EtherHub-12i	Accton Technology Corp.	254
432	Exide Powerware Prestige Model 1000 EXT	Exide Electronics Group Inc.	56
420	FileRunner for Windows	MBS Technologies Inc.	66
473	Front Page Sports: Football Pro	Dynamix Inc.	412
445	Gateway 2000 P5-60	Gateway 2000	128
446	HiQ P66 Pentium Graphics Ultra Station	HiQ Computer Systems Inc.	135
484	HP EtherTwist Hub/12	Hewlett-Packard Co.	265
411	HP OmniBook 425 Superportable PC	Hewlett-Packard Co.	61
447	IBM ValuePoint P60/D	IBM Personal Computer Co.	136
448	Insight Pro Pentium-EISA	Insight	136
485	Intellicom SP-HUB/B	Intellicom Inc.	270
457	Kiplinger's CA-Simply Money, Version 1.0	Computer Associates International Inc.	240
412	Laplink Wireless with AirShare	National Semiconductor Corp & Traveling Software Inc.	61
488	LattisHub 2803	SynOptics Communications Inc.	276
417	M.Y.O.B., Version 4.0	BestIWare	62
465	M.Y.O.B., Version 3.0	Teleware Inc.	217
406	Mac-In-DOS Windows, Version 2.0	Pacific Microelectronics Inc.	50
407	Mac-to-DOS for Windows, Version 1.0	Peripheral Land Inc.	50
404	MacAccess, Version 1.5	Hypro Technologies Inc.	50
405	MacDisk for the PC, Version 1.0	Insignia Solutions Inc.	50
430	Magic, Version 5.5	Magic Software Enterprises Inc.	42
458	Managing Your Money, Version 10.0	MECA Software Inc.	240
426	Microcom DeskPorte V.FAST	Microcom Inc.	58
455	Micrografx Designer, Version 4.0	Micrografx Inc.	188
409	Microsoft Office 4.0	Microsoft Corp.	37
464	Microsoft Profit, Version 1.0	Microsoft Corp.	206
410	Microsoft Word 6.0 for Windows	Microsoft Corp.	37
449	MSE Pentium-P	MS Engineering Inc.	142
472	NFL Coaches Club Football	MicroProse Software Inc.	412
427	Northgate ZXP-XL2/C	Northgate Computer Systems	51
418	OmniPage 5.0	Caere Corp.	66
418	OmniPage Professional 5.0	Caere Corp.	66
433	On-Schedule for Windows, Version 1.0a	Odyssey Computing Inc.	52
466	Peachtree Accounting for Windows, Release 2.0	Peachtree Software Inc.	223
429	Pegasus PCI	STB Systems Inc.	54
416	QuarkXPress 3.3	Quark Inc.	62
467	QuickBooks for Windows, Version 2.0	Intuit Inc.	227
459	Quicken for DOS, Version 7.0	Intuit Inc.	244
459	Quicken for Windows, Version 3.0	Intuit Inc.	244
431	Random House Unabridged Dictionary, Second Edition	Random House Reference and Electronic Publishing	56
413	ScanMan PowerPage	Logitech Inc.	61
428	Screen Thief, Version 1.50	Public Software Library	52
486	Series 3000 TriSegment Stackable Hub	NetWorth Inc.	274
468	Service Industry Accounting, Version 3.4	Sybiz International	230
474	Silverball	MicroLeague Interactive Software Inc.	412
423	SimHealth	Maxis Business Simulations	68
487	SMC Elite 3812TP	Standard Microsystems Corp.	275
413	SoundMan Wave	Logitech Inc.	61
419	StudioScan	AGFA Division of Miles Inc.	66
476	Take-A-Break Pinball For Windows	Dynamix Inc.	412
450	Tangent VL-P560	Tangent Computer Inc.	155
471	Tom Landry Strategy Football Deluxe Edition	Merit Software	412
408	TransferPro for Windows, Version 1.5	Digital Instrumentation Technology Inc.	50
481	UltraHub 1000	Cameo Communications Inc.	261
451	UT-Pentium60LB	Unitek Technology Inc.	157
402	Windows for Teens	Prima Publishing	73
424	XyWrite for Windows, Version 4.1	The Technology Group	54

TECHNICAL COLUMNS

User-to-User ..... A DEBUG script that lets you load COMMAND.COM into upper memory 277
User-to-User ..... A batch file that runs CHKDSK on more than one disk drive 277
Tutor ..... A look at graphics drawing algorithms 281
Corporate Developer ..... Database Design: Redundancy and Normalization 285
Toolkits ..... AccuSoft: Instant Image Processing 289
Environments ..... Extended pen creation under Windows NT 291
Power Programming ..... C++ template technology 297
Utilities ..... Spy on DOS Programs with INFORMER 302

SOLUTIONS

PCs ..... Finding drivers for high-resolution displays. 309
PCs ..... Reducing the time it takes to do large print jobs. 309
PCs ..... Emulating an Epson printer on a LaserJet. 309
Operating Environments Creating EDLIN scripts using EDLIN itself. 312
Operating Environments Loading DOS TSRs from a Windows DOS box. 312
Word Processing ..... Running DOS commands from within WordPerfect 5.1 314
Spreadsheets ..... Hiding rows in Lotus 1-2-3 for Windows 4.0. 320
Databases ..... An easier way to move a Paradox table to a different directory. 322
Graphics ..... Troubleshooting incompatible printer emulations. 322
Languages ..... How BASIC programs can pass information between DOS and Windows. 322

After Hours

BRINGING UP BABY: B.A.B.Y., Babydoc In A Disk; **FOOTBALL:** Tom Landry Strategy Football, NFL Coaches Club Football, Front Page Sports; **ARCADE MANIA:** Silverball, Eight Ball Deluxe, Take-A-Break Pinball for Windows

BRINGING UP BABY

Two Programs for Expectant Parents

BY JANET RUBENKING

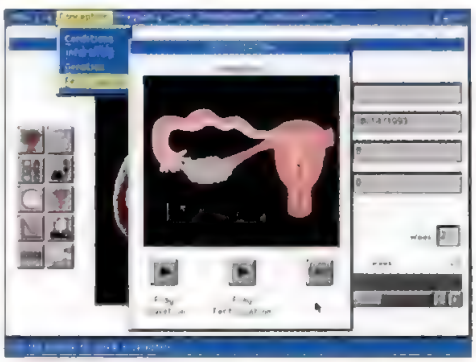
Becoming a parent is both a delight and a challenge. From the moment you learn that you (or your wife) are pregnant, you wonder and worry about your child's development, health, and well-being. Two new medical programs reassuringly take some of the guesswork out of these difficult tasks.

Software Marketing Corp.'s B.A.B.Y. teaches about conception, birth, and a child's early years. Babydoc In A Disk tracks your children's health and development. Finally, for the youngest computer users, The Berenstain Bears Learning at Home (reviewed in the sidebar "Spotlight on Toddlers") entertains and educates your two- to seven-year-old child, if you have the hard disk space for it.

SOFTWARE MARKETING CORP.

B.A.B.Y.

B.A.B.Y. (Birth and Baby Years) is a graphical, computerized pregnancy guidebook that takes you on a tour of pregnancy, the growth and development of the fetus, and labor and birth. The software condenses the rather exhaustive information found in most books on the subject, and covers such topics as infertility, genetics, diet, exercise, and pregnancy tests.



FERTILITY RITES? B.A.B.Y.'s animations cover such topics as ovulation and fertilization.

Information is displayed in text boxes and with animated pictures and graphs. Most of the charts are for illustration only, but a few will track personal data—for example, an expectant mother's weight gain and ovulation. Enter the date of your last period and the program will calculate your due date and display how far you are into your pregnancy and how many days you have left. The B.A.B.Y. software will store this and other information, such as your daily appointments and your doctor's phone number, in a personal file.

The program includes checklists that help you organize the nursery and pack your hospital bag. If you haven't chosen a name yet, you can always refer to B.A.B.Y.'s extensive names dictionary. Once your baby comes home, you can use B.A.B.Y. to record milestones for the first year, such as your child's first words.

B.A.B.Y., *$69.95.* Requires: *535K RAM, 2.5MB hard disk space, DOS 3.3 or later. Software Marketing Corp., 9830 South 51st St., Building A-131, Phoenix, AZ 85044; 602-893-3377; fax, 602-893-2042.*

Circle 469 on reader service card

BABYDOC PUBLISHING CO.

Babydoc In A Disk

Babydoc In A Disk is a text-only family medical database

Spotlight on Toddlers: *The Berenstain Bears Learn at Home*

Berenstain Bears stories are enormously popular with small children, and they're about to take over your hard disk in The Berenstain Bears Learn at Home, Volume 1 ($49.95), from Compton's NewMedia. This 20MB program teaches preschoolers how to dress, make their beds, brush their teeth, and follow bathroom and stairway safety rules.

Activities include simple jigsaw puzzles, matching games, and animations. Your child can simply click on a large icon to play or to watch the animated mishaps of Bumbler Bear as he learns safety rules the hard way. Professor Actual Factual Bear teaches your child facts about dinosaurs, fish, and home safety; Papa Bear invites your child to match emotions with pictures in the family album. The program takes up 20MB of disk space, largely due to the enormous sound files. (Compton's NewMedia, 619-929-2500. Circle 477 on reader service card.)

chock full of useful information about your child's health. If your child is showing signs of illness, name the symptoms and narrow your search for the cause. If you are unsure about your child's medication, look it up in the drug database. Or if you are just curious about your child's physical growth, chart it with the developmental checklist and the percentile rankings for weight, height, and head size.

DISEASE DATABASE

Babydoc doesn't come with a manual, but the on-line help system is adequate. The database of diseases is extensive, including more than most families will probably ever need. But that thoroughness doesn't always promise an accurate diagnosis. For instance, when I listed a group of symptoms of the common cold, the program turned up dozens of disorders but *not* cold or flu.

Babydoc exists to help prepare you for your child's well-baby visits to the pediatrician. It will call attention to unusual growth patterns, provide information about the risk of lead poisoning, and remind you which immunizations your child should receive at a particular checkup. This program isn't meant to replace the family doctor but to help you between visits. Used in this manner, Babydoc in a Disk can help you survive the first several months with your new child.

Babydoc In A Disk, *$49.95.* Requires: *400K RAM, 10MB hard disk space, DOS 3.1 or later. Babydoc Publishing Co., P.O. Box 26180, Fresno, CA 93729-6180; 800-642-3543, 209-725-2070; fax, 209-725-2064.*

Circle 470 on reader service card

THE PROGRAM

Football Sims Cure Post–Super Bowl Blues

BY BRAD GRIMES

Once the Super Bowl is over for the season, football fans face months without a Sunday afternoon fix. But for armchair quarterbacking any time of year, grab a clipboard and check out the football simulation games that let you make the calls.

All of the games here—Tom Landry Strategy Football Deluxe Edition, NFL Coaches Club Football, and Front Page Sports: Football Pro—feature complete rosters and schedules for league play. You call plays, make substitutions, and anticipate your opponents' moves.

In all of these games, you have to dig through the playbooks in order to find the right plays; you can also edit team rosters and the plays themselves. The ease of accomplishing these tasks varies from one package to the next. A video tape mode allows you to watch replays over and over again. Each game plays an assortment of yells and whistles through a PC speaker, but a sound board truly captures the excitement and intensity of the sport.

To make the experience complete, Impulse Software (214-437-2849) offers a $69.95 mouse that is shaped like a football, with a mouse pad that looks like a playing field.

BEAT THE CLOCK: You'll win points for calling plays quickly in Coaches Club Football.

STRATEGY ONLY: In Tom Landry Strategy Football, choose plays from an easy to read playbook.

MERIT SOFTWARE

Tom Landry Strategy Football Deluxe Edition

Of the three football programs, Tom Landry Strategy Football Deluxe Edition (TLSF Deluxe), is the easiest to play. Since it's exclusively a strategy game, you have no control over any of the players on-screen and you won't need a joystick.

Before you start a game, it's always a good idea to scout your opponent. TLSF Deluxe provides numeric ratings and grades that quickly let you know who the best players are.

The greatest pleasure in playing TLSF Deluxe is derived from the playbook. You don't need to remember cryptic play names or figure out which way your players will run from looking at a confusing sketch. As you click on choices of formations and patterns, a diagram changes to show you how the play will unfold. The drawback to simplicity, however, is monotony.

If you don't know what to do in a given situation, you can ask Tom Landry for advice, although even he makes mistakes. There's no play clock pressuring you to call a play, so you can slow down and carefully look over your options.

TLSF Deluxe is not endorsed by the National Football League, so player names have been altered and teams are identified by city, not name. In addition, the team editor is not integrated into the game, so if you want to edit a team's characteristics you have to exit TLSF Deluxe and run the editor from the DOS prompt.

Tom Landry Strategy Football Deluxe Edition, *$49.95.* Requires: *1MB RAM, DOS 5.0 or later, 3.5MB hard disk space. Merit Software, 13707 Gamma Rd., Dallas TX 75244; 800-323-0884, 214-385-2353.*

Circle 471 on reader service card

MICROPROSE SOFTWARE INC.

NFL Coaches Club Football

MicroProse Software's NFL Coaches Club Football has

garnered the most NFL endorsements. That means you get to play with complete, real-life rosters for the 1993 season.

BEST GRAPHICS: Front Page Sports comes closest to real NFL football.

The game is so up-to-date that it includes the New England Patriots' new emblem as well as those of several other teams.

Coaches Club Football includes playbooks for each team that contain 80 offensive and 80 defensive plays. Every play has a number and name that requires a knowledge of football lingo to understand. When you call a play during a game, you should know every play and every play number, so you can choose it from a scrolling menu. Coaches Club Football has a play clock running against you, so if you don't hurry you'll be penalized.

NFL Coaches Club Football, *$69.95.* Requires: *2MB RAM, 7MB hard disk space, DOS 5.0 or later. MicroProse Software Inc., 180 Lakefront Dr., Hunt Valley, MD 21030; 800-879-7529, 410-771-0440; fax, 410-771-1174.*

Circle 472 on reader service card

DYNAMIX INC.

Front Page Sports: Football Pro

Front Page Sports: Football Pro is the latest edition of Dynamix's comprehensive football-simulation game. It is endorsed by the NFL Players Association, so all the real-life players' names are here, but it's not endorsed by other NFL bodies, so the team names have been altered.

This game has the best graphics and is the most realistic of the three packages. It allows you to draft players, sign free agents, and put a team through training camp. Playing a game on artificial turf can take its toll on your players' knees, which can affect their play.

The game has three modes: basic, standard, and advanced. As you move up through the ranks, you have to memorize your game plan, so you can call plays effectively and beat the play clock. Hit the practice field on a regular basis to run through or modify your plays. There's a lot to absorb when you pick up Front Page Sports: Football Pro, but you'll never grow tired of this game.

Front Page Sports: Football Pro, *$79.95.* Requires: *2MB RAM, 11MB hard disk space, DOS 5.0 or later. Dynamix Inc., 1600 Mill Race Dr., Eugene, OR 97403; 800-326-6654, 503-343-0772; fax, 503-344-1754.*

Circle 473 on reader service card

ARCADE MANIA!

Three Pinball Games Put Action on the Little Screen

BY DONALD B. TRIVETTE

Think you're too grown up for a pinball arcade, do you? That's okay: Three new computer games allow you to experience the thrill of mounting scores (and the agony of the tilt) without having to fight with the kids at the mall.

The arcade action heats up with MicroLeague Interactive Software's Silverball, Amtex Software Corp.'s Eight Ball Deluxe, and Dynamix's Take-A-Break Pinball for Windows. If you want a realistic pinball game, buy Eight Ball Deluxe, with its realistic pool table graphics. Silverball ranks a close second, while Take-A-Break Pinball for Windows, as its name suggests, is a Microsoft Windows jockey's only choice.

MICROLEAGUE INTERACTIVE SOFTWARE INC.

Silverball

Silverball gives you a choice of four colorful VGA gaming tables: Fantasy, with a dragon theme; Blood, which is peopled by denizens of the dark; the preppy Snooker Champ; and my favorite, Odyssey, with characters drawn from ancient mythology.

Silverball smoothly scrolls from top to bottom to follow the ball; this is a good way to squeeze the vertical pinball table into an almost-square computer screen. As with all of these games, the flippers or paddles are controlled by the shift keys, and the space bar simulates the knee action of a gentle nudge. Sound effects are hot. Bumper and ricochet action are true to life, and ramps, rails, drop holes and targets challenge the nimblest fingers. Silverball offers realistic play for up to four players.

Silverball, *$49.95.* Requires: *640K RAM, 3MB hard disk space, DOS 3.3 or later. MicroLeague Interactive Software Inc., University Office Plaza, 201 Bellevue Bldg., Newark, DE 19702; 800-334-6572, 302-368-9990; fax, 302-368-8600.*

Circle 474 on reader service card

AMTEX SOFTWARE CORP.

Eight Ball Deluxe

Eight Ball Deluxe is a faithful reproduction of the classic Bally pinball table found in arcades around the world. The 256-color, VGA program uses full vertical scrolling over three screens to give it the largest playing table of any digital pinball game. Sound effects were sampled from the real machine and optimized for a range of popular sound cards.

FANTASTIC TABLES: Silverball's scrolling tables feature themes from mythology.

The object, as the program's name suggests, is to run the rack of pool balls and sink the eight ball. With a little practice,

Eight Ball Deluxe

I scored 200,000 to 300,000 points, but that's nowhere near the pros, who consistently rack up millions. Amtex says that the best score is 5 million points: something to shoot for. With beautiful graphics and a big table, Eight Ball Deluxe is the most advanced digital pinball game to date.

RACK UP BIG POINTS: Eight Ball Deluxe's giant pool table scrolls over three screens.

Eight Ball Deluxe, *$49.95.* Requires: *1MB RAM, DOS 3.1 or later, 2.5MB hard disk space. Amtex Software Corp., P.O. Box 572, Belleville, Ontario, Canada K8N 5B2; 613-967-7900; fax, 613-967-7902.*

Circle 475 on reader service card.

DYNAMIX INC.

Take-A-Break Pinball For Windows

Fans of Leisure Suit Larry, Roger Wilco, and Sir Graham will find these characters hiding out in Take-A-Break Pinball For Windows, in which tables are keyed to Sierra On-Line's most popular adventure games. Eight tables in all, each with different layouts, give players a variety of challenges.

Take-A-Break is less like traditional pinball than the other programs in this review, and it has a less than realistic feel. There are simply fewer bells and whistles. Still, I liked the themes, especially Larry's Big Score and Quest for Daventry. The small size of the table, which is located on the left side of the screen, was annoying after I got used playing on the oversized scrolling tables. Nevertheless, Take-A-Break is the only pinball game that is available for Windows. It offers a wide variety of tables and good sound, but has a small table size.

FRIENDLY FACES: Take-A-Break's familiar Sierra On-Line themes are Windows users' best choice.

Take-A-Break Pinball For Windows, *$49.95.* Requires: *386SX-based PC or better, Microsoft Windows 3.1, sound card recommended; Dynamix Inc., 1600 Millrace Dr., Eugene, OR 97403; 800-326-6654; fax, 503-344-1754.* □

Circle 476 on reader service card

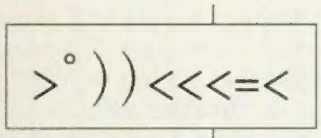
MOVING?

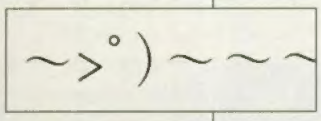
Please write to: PC Magazine, P.O. Box 54093, Boulder, CO 80322. Include your mailing label from a recent issue of PC Magazine for faster service. Please allow up to 60 days for change of address to take place.

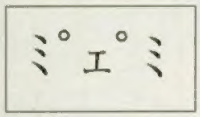
Abort, Retry, Fail?

THE LIGHTER SIDE OF PERSONAL COMPUTING

By Don Willmott







Check Out These Japanese Emoticons

If you have a Japanese keyboard, you can easily make any number of interesting and entertaining emoticons, including this scaly fish, slippery snake, and tame-looking tiger. We found them in a book called *Niko!: The Smiley Book* (Shoeisha Co.; ISBN: 4-88135-050-1).

Classified Intelligence

"Computer System ideal for home office, HP 150, 2 printers, modem, 10 programs, 4 matted discs. Asking $2,700."
—*THE NEW YORK TIMES*

BUZZWORD WATCH

utilitainment A software category including screen savers and programs like The Far Side Daily Planner that combine a utility with entertainment.
First heard: *All over the place, unfortunately.*

Is This What They Mean by "Chip Puller"?

"If you use the system in a dirty environment, open it periodically and vacuum the boards and components with a small vacuum designed for this kind of work. Don't loosen anything in the process—sucking all the chips off the system board with an industrial strength wet/dry vac is not covered by your warranty!"
—GATEWAY 2000 USER MANUAL

THE BIGGEST AND SMARTEST DICTONARY AVAILABLE IN TEN YEARS!

Now this is a funny typo.

PC Sales Surge

	PCs sold for home use	Revenue (billions)
1990	4 billion	$4.2
1991	3.9 billion	$4.3
1992	4.5 billion	$5.1
1993[1]	5 billion	$6
1994[1]	5.4 billion	$6.6

1 – estimate Source: Link Resources

According to USA Today, PCs are now selling for about $1.20.

Right—Univacs Still Cost Around $1,500

"'You'd be hard-pressed to get a computer on the market for less than $900,' said Michael Erbschloe, considering the cost of computer chips, cabinets, and tubes."—*THE WASHINGTON POST*

Love Me, Lotus, Love Me True

Faithful reader Mike Morone, who teaches adult software courses in Rochester, New York, reports that during a recent Lotus 1-2-3 graphics session, he asked his adult students to type in a legend. Making his way around the class, Morone noticed that one student had typed in "Elvis."

ARF on the road: Rawlins, Wyoming.

Richard Tennant

If your entry is used, we'll send you $50 and a *PC Magazine* T-shirt. Send your entries to Abort, Retry, Fail?, *PC Magazine*, One Park Ave., New York, NY 10016-5802. Winners this issue: Beverly Beem, Linda Eisen, Harvey Feder, Robert W. Leigh, Mike Morone, and Warren von Uffel.

"Why on earth would this bozo think I'd want to buy a 1993 Pentium with a bus that's been dragging its butt since 1984?"

INTRODUCING THE "NO BOZO" PCI BUS PENTIUM PC.

Imagine trying to pawn off a Pentium™ machine with a bus designed for a 286 antique! Well, that's not the case with the Dell Dimension™ XPS Pentium PCs. These racehorses feature a 60MHz Pentium Processor that delivers nearly twice the performance of the i486™ 66MHz CPU. And thanks to a redesigned floating point unit, these Pentium systems deliver up to five times the performance of the i486 66 processor in math-intensive applications.

What's more, Dell Dimension XPS Pentium systems feature the PCI bus. Capable of sustaining 120MBps as opposed to 16 with ISA, these systems take full advantage of the processing power of the Pentium CPU. Delivering maximum performance from even the most graphic-intensive Windows™ applications.

So don't settle for today's CPU with yesterday's I/O technology. Call Dell. And forget about those other bozos.

intel inside

DELL DIMENSION XPS P60. PCs DESIGNED FOR THE HIGH PERFORMANCE USER.

DELL DIMENSION XPS P60
PENTIUM 60MHz SYSTEMS

$2,999
BEST BUY

Business Lease: $111/MO.

• 8MB RAM • 128MB Max RAM • 450MB Hard Drive • 256KB External Cache • 5 Expansion Slots Available (3 16-Bit ISA, 1 PCI, 1 PCI/ISA Shared) • PCI #9GXE Video Accelerator Card with Video Control Panel Software • 1MB Video RAM • UltraScan™ 14C Monitor (14", 1024 x 768, .28mm, NI) • One Diskette Drive (3.5") • Spacesaver Keyboard • Multi-Session, Double-Spin CD ROM Drive • MS-DOS® 6.0/Microsoft® Windows 3.1/ Mouse

Order Code **#5000121**

$3,599
Business Lease: $130/MO.

• 16MB RAM • 128MB Max RAM • 528MB Hard Drive • 256KB External Cache • 5 Expansion Slots Available (3 16-Bit ISA, 1 PCI, 1 PCI/ISA Shared) • PCI #9GXE Video Accelerator Card with Video Control Panel Software • 1MB Video RAM • UltraScan 15FS Monitor (15", 1024 x 768, .28mm, NI) • One Diskette Drive (3.5") • Spacesaver Keyboard • Multi-Session, Double-Spin CD ROM Drive • MS-DOS 6.0/Microsoft Windows 3.1/Mouse

Order Code **#5000122**

$3,999
ADVANCED TECHNOLOGY

Business Lease: $144/MO.

• 16MB RAM • 128MB Max RAM • 528MB Hard Drive • 256KB External Cache • 5 Expansion Slots Available (3 16-Bit ISA, 1 PCI, 1 PCI/ISA Shared) • PCI #9GXE Video Accelerator Card with Video Control Panel Software • 1MB Video RAM • UltraScan 17FS Monitor (17", 1280 x 1024, .26mm Stripe Pitch, NI) • One Diskette Drive (3.5") • Spacesaver Keyboard • Multi-Session, Double-Spin CD ROM Drive • MS-DOS 6.0/Microsoft Windows 3.1/Mouse

Order Code **#5000123**

DELL™

TO ORDER, CALL
800-433-7303

HOURS: MON-FRI 7AM-9PM CT SAT 10AM-6PM CT SUN 12PM-5PM CT
IN CANADA* CALL 800-668-3021. PLEASE REFERENCE **#11BKC**

PC
MAG

L
I
B
R
A
R
Y

THE ONE WITH THE MOST TOYS WINS.

15" UltraScan™ color monitor (1024 x 768, .28mm, NI)

230MB hard drive and 128KB external cache

7 expansion slots (5 available)

VL #9GXE video accelerator card with video control panel software

$2,799

One-year next-business-day on-site service[Δ]

50MHz processor with 8MB of RAM

Multi-session, double-spin CD ROM drive

One diskette drive (3.5")

Sound Blaster 16-bit CD-quality audio card

Peavey amplified speakers

Labtec Dynamic microphone

Just in case you missed the price in all of the excitement, we'd be happy to show you one more time: $2,799. (Business Lease[◊]: $104/Mo.).

You might find some other multimedia systems out there. But you won't find anything in the same league as the Dell Dimension™ XPS 450V. At least not for the price.

And it's just one of a whole family of affordably priced Dell multimedia systems.

Each one configured to give you more bla your dollar. From the company that ranked h in the 1993 J.D. Power and Associates Deskt Personal Computer Satisfaction Study amon business users.[†]

Call to order your Dell Dimension XPS 450V today. And come out a winner.

DELL™

TO ORDER, CALL

800-433-3416

HOURS: MON-FRI 7AM-9PM CT SAT 10AM-6PM CT SUN 12PM-5PM CT

IN CANADA, CALL 800-668-3021. PLEASE REFERENCE **#11BKB**

Order Code **#5000120**

intel inside

†1993 J.D. Power and Associates Desktop Personal Computer Satisfaction Study conducted among business users and based on 1,956 user respondents.

NETWORK
EDITION